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TREMBLING HAND PERFECTION IN REPEATED TWO STACKELBERG LEADER AND FOLLOWER

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ABSTRACT

In this paper, we present a two leader-two follower model with repeated play (finitely and infinitely) and with trembling hand perfection that is a consistent extension of Stackelberg's leader-follower duopoly. How the leader-firm can utilize the true reaction curve of the follower-firms with the possibility of mistakes, although the rationality works. We observe the result when one leader-firm produce Nash-Cournot output in finite play and infinite play of the game. And both the leader-firm produces Nash-Cournot output in finite play and infinite play of the game. The Cournot duopoly and the Stackelberg leader-follower models are special cases of this model with trembling hand perfection, the analysis in this paper provides study of the existence and uniqueness of an equilibrium solution.

Keywords: Repeated Game, NE, Stackelberg and Cournot model, Trembling hand

1. INTRODUCTION

1.1 Game theory studies the behavior of decision-makers (players) whose decisions affect each other. Game theory is concerned with both matters: defining "solution concepts", and then investigating their properties, in general as well as in specific models coming from the various areas of application(Stackelberg model-Cournot Model),this leads to mathematical theories that ultimately yield important and novel insights, quantitative as well as qualitative. Repeated games model ongoing relationships: the theory "predicts" phenomena such as cooperation, communication, altruism, trust signaling, threats. This paper analyzes two Stackelberg leader-follower extension of (single) Stackelberg leader-follower game for duopoly market in which firm produce a homogeneous good non-cooperatively.

1.2 Leader-follower firm are distinct due to having some basic economic ability to produce a wide range of outputs with reasonable profit margin and their size. We can distinct the leader and follower by emerging in industries comprised of some well established firms with sound assets, and other newer, more fragile firm. The follower firms, being less resilient to business shocks, may hence adopt a follower role in the market, awaiting for the more established leader firms to stabilize before making decisions on their own production levels. Undoubtedly, obtained equilibrium solution is a fixed point of the dynamic process in which the leader-and follower-firms readjust output levels according to the strategic market assumptions.

1.3 Two Stackelberg leader-follower model assumes the existence of two leaders, with each leader operating under the incorrect presumption that all the other firms are follower-firms in each stage play finitely or infinitely. We assume that each leader-firm acts assuming that its actions do not precipitate responses from other leader-firms, but does explicitly consider the aggregate follower reaction curve in repeated game. In each period, this curve gives the equilibrating output of the follower-firms, in response to a given total leader output. Since each firm knows which firms are leader and followers, but this situation does not necessarily inclined towards the state of disequilibrium. If an equilibrium solution exists, both the follower-firms choose best response function to maximize its profit subject to the Cournot assumption regarding the other firms, and each leader maximized its profit under the assumption of no response from the leader-firms, but having explicitly considered the aggregate follower reaction curve.

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1.4 Literature of the model is wide, the classical Stackelberg game (Stackelberg 1934) models competition in a duopoly market composed of one leader and one follower. The leader makes its decision taking into account the reaction of the follower. Okuguchi (1976, 1978) and Furth (1979) have also presented consistent extensions of Stackelberg model to the multiple leader situations in a way that gives equilibrium rather than disequilibrium. Sherali et al. (1983) extended the classical Stackelberg model by considering the case where there are several followers that reach Nash- Cournot equilibrium among themselves. Sherali (1984) further extended the model by considering multiple leaders, gave conditions for the existence of equilibrium as well as for the concavity and piecewise linearity of the objective function of each leader. Sherali also showed the uniqueness of equilibrium for the case where leaders are identical (that is, leaders have identical cost functions) and, in addition, identical leaders make identical decisions. DeMiguel, V (2009) showed the existence and uniqueness resulting equilibrium a stochastic multiple –leader Stackelberg-Nash-Cournot equilibrium.

1.5 Organization of the remainder of this paper is: In section1-we presented the basic concept of game theory with repeated play with applications of mathematical model (Stackelberg model) and wide literature in study of multi leader-follower game with the existence and uniqueness of equilibrium. In section2-we presented the mathematical model of the two leader- two follower Stackelberg game with repeated play. In Section3-shows trembling hand perfection results in repeated play with two leader-two follower (Stackelberg and Cournot game). In section 4, we show existence and uniqueness of the model. In last section of this paper, we have presented the conclusion and future research.

2. MATHEMATICAL MODEL

2.1 In this section, we introduce notation, assumptions, definitions and preliminary concepts. The present section is a model of two leader-two follower Stackelberg game. Let $p(Q)(t)$, $Q(t) \geq 0$ represent the industry (inverse) demand function and assume that there are 2-leader-firms and 2-follower-firms with respect to the total cost functions

$$L_i(l_i)(t),\ l_i(t) \geq 0\ \ for\ \ i = 1,2 \quad \text{and}\ \ F_j(f_j)(t), f_j(t) \geq 0\ \ for\ j = 1,2\ .$$

Assumptions (**A$_1$**): If $p(\,.\,)(t)$ is strictly decreasing, twice differentiable and $p'(z)(t) + z(t)p''(z)(t) \leq 0$ for each $z(t) \geq 0$

Assumptions (**A$_2$**): Total cost function for the leader-firms $L_i(\,.\,)(t)\ for\ \ i = 1,2$ and for the follower-firms $F_j(\,.\,)(t)\ for\ j = 1,2$ are twice differentiable, nonnegative, and nondecreasing convex functions, and moreover, there exists a quantity $z_u(t) > 0$ large enough so that $L_i'(z)(t) \geq p(z)(t)$ and $F_j'(z)(t) \geq p(z)(t)$ for all $z(t) \geq z_u(t)$ .for each $i = 1,2$ for each $j = 1,2$.

As an example, a linear demand curve $p(q)(t) = a - bq(t), q(t) \geq 0. where\ a > 0\ and\ b > 0$ satisfies the conditions for Assumptions (Note that for mathematically we allow $p(\,.\,)(t)$ to be negative for $q(t) > {}^{a}/_{b}$. The optimization implies that $p(\,.\,)(t)$ is positive in equilibrium since with nondecreasing cost functions, $z_u(t) \equiv {}^{a}/_{b}$ is valid for the derivative of the cost function be greater than the inverse demand function for all $z(t)$.)

2.2 Now for two leader-firms and two follower-firms problem, for $l(t) \geq 0, let\ [f_1(l)(t), f_2(l)(t)]$ be the joint reaction curves of the follower-firms and let total output of the follower $f(l)(t) = f_1(l)(t) + f_2(l)(t)$ be the aggregate reaction curve. Then a set of output quantities ($l_1^*(t)$, $l_2^*(t)$, $f_1^*(t)$, $f_2^*(t)$) for the 2-leaders and the 2-followers respectively is said to be a Stackelberg-Nash-Cournot (SNC) equilibrium solution if profit functions for the leader-firms and follower-firms are the following:

For leader-firms

$$\pi_{i=1}(l_1(t), l_2(t), f(l = l_1 + l_2)(t))(t) = l_1(t)p\big(l_1 + l_2 + f(l_1 + l_2)\big)(t) - L_1(l_1)(t) \qquad \text{(i)}$$

$$\pi_{i=2}(l_1(t), l_2(t), f(l = l_1 + l_2)(t))(t) = l_2(t)p\big(l_1 + l_2 + f(l_1 + l_2)\big)(t) - L_2(l_2)(t) \qquad \text{(ii)}$$

For follower-firms

$$\pi_{j=1}(l_1(t), l_2(t), f(l = l_1 + l_2)(t))(t) = f_1(t)p\big(l_1 + l_2 + f(l_1 + l_2)\big)(t) - F_1(f_1)(t) \qquad \text{(iii)}$$

$$\pi_{j=2}(l_1(t), l_2(t), f(l = l_1 + l_2)(t)) = f_2(t)p\big(l_1 + l_2 + f(l_1 + l_2)\big)(t) - F_2(f_2)(t) \qquad \text{(iv)}$$

Now applying first order condition $\pi'_{i=1}(l_1(t), l_2(t), f(l)(t))(t) = 0 \Leftrightarrow \frac{\partial \pi_{i=1}(.)(t)}{\partial l_1} = 0$

$$p(l_1(t) + l_2(t) + f(l)(t)) + l_1(t)p'(l_1(t) + l_2(t) + f(l)(t))(t) = L'_1(l_1)(t)$$

$$l_1^*(t) = \frac{L'_1(l_1) - p(l_1+l_2+f(l))}{p'(l_1+l_2+f(l))}(t) \quad \text{(v)}$$

And $\pi'_{i=2}(l_1(t), l_2(t), f(l)(t))(t) = 0 \Leftrightarrow \frac{\partial \pi_{i=2}(.)(t)}{\partial l_2} = 0$

$$p(l_1(t) + l_2(t) + f(l)(t)) + l_2(t)p'(l_1(t) + l_2(t) + f(l)(t))(t) = L'_2(l_2)(t)$$

$$l_2^*(t) = \frac{L'_2(l_2) - p(l_1+l_2+f(l))}{p'(l_1+l_2+f(l))}(t) \quad \text{(vi)}$$

Total production by Stackelberg leader-firms $l^*(t) = l_1^*(t) + l_2^*(t)$

$$l^*(t) = \frac{L'_1(l_1) + L'_2(l_2) - 2p(l_1+l_2+f(l))}{p'(l_1+l_2+f(l))}(t) \quad \text{(vii)}$$

2.3 Stackelberg leader-firms are identical which produce homogeneous good of the game. Thus a strategy of leader-firms is simply an output. Stackelberg follower-firms produce after every history in which Stackelberg leader-firms chooses an output. Thus a strategy of Stackelberg follower-firms is a function that associates an output for follower-firms with each possible output of leader-firms. Subgame perfect equilibrium output of the S-C-game is ($l_1^*(t)$, $l_2^*(t)$, $f_1^*(t)$, $f_2^*(t)$). In two leader-two follower game output of two leader-firms more than the output of two follower-firms as $l(t) > f(t) in\ each\ period$.If all four firm play only Cournot game, then generated output in this C-game be less than the total output of the above game ($l_1^*(t) + l_2^*(t) + f_1^*(t) + f_2^*(t)$).

2.4 A weak version of this result holds under a very general condition: For any cost and inverse demand functions for which Stackelberg follower-firms has a unique best response to each output (range) of Stackelberg leader-firms, Stackelberg leader-firms are at least as well off in any subgame perfect equilibrium of Stackelberg's game as it is in any Nash equilibrium of Cournot-game.

Argument: One of Stackelberg leader-firms' options in S-Game is to choose its output in Nash equilibrium of Cournot–game. If it chooses such an output, then Stackelberg follower-firms' best action to choose its output in the same Nash equilibrium, given the assumption that it has a unique best response to each output of two Stackelberg leader-firms. Thus by choosing such an output, Stackelberg leader-firms obtains its profit at a Nash equilibrium of C-game; if Stackelberg leader-firms chooses a different output it may possibly obtain a higher payoff.

Stackelberg leader-firms' output range of production: $l_i(t) \in [\ \underline{l}_i(t), l_i^*(t)\ ], i = 1,2.$

Where$\underline{l}_i(t)$: Nash equilibrium of Cournot–game, $l_i^*(t)$: Stackelberg-Nash-Cournot (SNC) equilibrium.

a) Total production of two Stackelberg leader-firms when both produce Stackelberg-Nash-Cournot equilibrium

$$l^*(t) = l_1^*(t) + l_2^*(t)$$

b) Total production of two Stackelberg leader-firms when 1- leader firm produces Stackelberg-Nash-Cournot equilibrium and 2 – leader firm produce Nash equilibrium of Cournot-game.

$$l_{\underline{2}}^{1*}(t) = l_1^*(t) + \underline{l}_2(t)$$

c) Total production of two Stackelberg leader-firms when 1- leader firm produce Nash equilibrium of Cournot-game and 2–leader firm produces Stackelberg-Nash-Cournot equilibrium.

$$l_{\underline{1}}^{2*}(t) = l_2^*(t) + \underline{l}_1(t)$$

d) Total production of two Stackelberg leader-firms when 1- leader firm produce Nash equilibrium of Cournot-game and 2 – leader firm produce Nash equilibrium of Cournot-game.

$$l_{\underline{12}}(t) = \underline{l}_1(t) + \underline{l}_2(t)$$

Then we can say trembling hand perfection of the game belong to semi-open interval $[l_{\underline{12}}(t),\ l^*(t)), if$ any leader-firm slightly deviate to produce SNC-equilibrium, then total two Stackelberg leader-firms' output belong to semi-open interval $[l_{\underline{12}}(t),\ l^*(t))$.

And we observe in the output range with trembling hand perfection is

$$\underline{l_{12}}(t) \leq \underline{l_2^{1*}}(t) \leq \underline{l_1^{2*}}(t) < l^*(t)$$

3. REPEATED GAME OF TREMBLING-HAND PERFECTION

3.1 Trembling-hand perfection means in quite simple way is the possibility of occurring a mistake. We noted that although rationality does not rule out the choice of weakly dominated strategy; such strategies are unappealing because they are dominated unless a player is absolutely sure of what his rivals will play. As shown in above section, Nash equilibrium plays a weakly dominated strategy with certainty. This leads us to define a refinement of the concept of Nash equilibrium, known as a trembling-hand perfect Nash equilibrium, which identifies Nash equilibria that are robust to the possibility that, with some very small probability, players make mistakes. It is defined by Selten (1975), in perturbed game, we want to consider as predictions in original game by requiring that each player play every one of his strategies with at least some minimal positive probability due to that player get played by mistake.

Stackelberg leader-firm deviate to play SNC-equilibrium, in which, there may be a condition of the one leader deviation or the both leader deviation, then the Stackelberg follower-firms play always according the best response function of it.(here we are considering the deviation from SNC-equilibrium to the Stackelberg leader-firm which always have the quantity choice to produce in making decision of the Stackelberg follower-firm, profit maximize than the follower-firm). As we get above the production interval of Stackelberg leader-firms deviation in semi-open interval.

Stackelberg leader-firms' output range of production: $l_i(t) \in [\ \underline{l_i}\ (t), l_i^*(t)\ ]\ , i = 1,2.$

Where$\underline{l_i}\ (t)$: Nash equilibrium of Cournot–game, $l_i^*(t)$: Stackelberg-Nash-Cournot (SNC) equilibrium.

a). $l^*(t) = l_1^*(t) + l_2^*(t)$

b). $\underline{l_2^{1*}}(t) = l_1^*(t) + \underline{l}_2(t)$

c). $\underline{l_1^{2*}}(t) = l_2^*(t) + \underline{l}_1(t)$

d). $\underline{l_{12}}(t) = \underline{l}_1(t) + \underline{l}_2(t)$

3.2 Results of comparative payoff in finite periods of the game-

$$\pi_{i=1}(c\ or\ d\ condition, f(c\ or\ d\ output)(t) < \pi_{i=1}(a\ or\ b\ output, f(a\ or\ b\ output)(t)$$

$$\pi_{i=2}(b\ or\ d\ condition, f(b\ or\ d\ output)(t) < \pi_{i=2}(a\ or\ c\ output, f(a\ or\ c\ output)(t)$$

$$\pi_{i=1\ or\ 2}(\ d\ condition, f(\ d\ output)(t)$$

$$< \pi_{i=1\ or\ 2}(c\ output, f(c\ output)(t)$$

$$\leq \pi_{i=1\ or\ 2}(\ b\ condition, f(\ b\ output)(t)$$

$$< \pi_{i=1\ or\ 2}(a\ output, f(a\ output)(t)$$

Repeated trembling-hand perfection criterion is not formulated in terms of beliefs, we can use the sequence of strictly mixed equilibrium strategies in the perturbed games of the agents normal form as our strategy sequence for deriving sequential equilibrium beliefs. Because the limiting strategies in the extensive form trembling-hand perfect equilibrium are best responses to every element of this sequence, they are also best responses to each other with these derived beliefs.

4. EXISTENCE AND UNIQUENESS OF EQUILIBRIUM

Best response function of Stackelberg follower-firm $f(z)$is continous, nonnegative and strictly decreasing over its $z \geq 0$ and the function $Q(z) = z + f(z)$ is strictly increasing for $z \geq 0$. Furthermore, $for\ \forall\ f_j(.)$ is continuous, nonnegative and nonincreasing function for j=1, 2.

Conditions under the assumption ensure the existence of equilibrium of a set of quantities q which simultaneously satisfy for leader-firms' profit to be maximized under the assumptions

For leader-firms

$$\pi_{i=1}(l_1(t), l_2(t), f(l = l_1 + l_2)(t))(t) = l_1(t)p\big(l_1 + l_2 + f(l_1 + l_2)\big)(t) - L_1(l_1)(t) \quad \text{(viii)}$$

$$\pi_{i=2}(l_1(t), l_2(t), f(l = l_1 + l_2)(t))(t) = l_2(t)p\big(l_1 + l_2 + f(l_1 + l_2)\big)(t) - L_2(l_2)(t) \quad \text{(ix)}$$

Maximizes a continuous, possibly nonconvex, objective function over a convex, closed and compact set [0, z_u].
Existence of an equilibrium under assumptions and with $Q(.)$ assumed convex provide the uniqueness of the equilibrium, if we take in it proof that each firm produce the same quantity. Profit maximization function for the leader-firms show a fixed point of output, which is unique equilibrium for the follower-firms.

5. CONCLUSION

In this paper, two Stackelberg leader-firms decide production quantity independently with rationality, having a trembling aspect with positive probability in each period. Doing mistake is a natural phenomenon which takes place in rationality also, it does not rule out the possibility of doing mistake. When Stackelberg leader-firm plays the production level other than Stackelberg-Nash-Cournot, there is a situation of trembling hand perfection in the repeated game. It can be seen more or less in the game, depending on the player how careful he is to maximize the payoff. It is the game of two leaders in which at least one can tremble from SNC, play its dominated strategy on which follower-firms decide the quantity to produce as per the best response, each trembling play of the leader giving the chance to increase followers' payoff. As we know this is the game of complete information with identical aspect of playing. Each firm knows each other's production level and cost function in each repeated play. As the history of the repeated game leader firms can incline to make decision of the production level. If we consider more than two leader then output of follower firm reduce and trembling hand perfection also reduce due to increase in the market competition. This condition, convert the whole market into perfect competition where follower firms face difficulty of its existence in the perfect market. Each identical leader-firm is more aware to play with rationality but this condition can not remove the trembling hand perfection in repeated game. Similarly increase in more number of the follower firms convert the market into the perfect competition, it is true with follower firm that there is heavy reduction in their quantity production and profit. It may deviate the follower firm to leave the game if it has less patience.

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FAST AND SLOW MODES IN PLASMA WITH NEGATIVELY CHARGED DUST GRAINS

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ABSTRACT

Considering homogeneous and inhomogeneous plasmas, we write the basic fluid equations for the plasma having ion fluid and electron fluid along with negatively charged dust grains. The conservation of the plasma is assumed through the continuity equation and the motion of the ions is determined by the equation of motion. The excitation of wave in the presence of electric field is confirmed through the relation between the field and charge separation / density. We use normal mode analysis for the investigation of different types of waves in the present plasma. Considering the oscillating / perturbed quantities as $e^{i(kx-\omega t)}$, we solve the basic set of equations for obtaining the relation between ω and k , as ω gives the frequency of oscillations and k gives the wavelength of the wave. This dispersion relation is solved to get the roots of ω, based on which we analyze the modes' propagation. The effects of electron temperature, dust grain concentration, dust charge and charge number on the phase velocities of different waves are examined. It is found that two types of the modes propagate in the inhomogeneous plasma and their phase velocities increase with the electron temperature, dust grain concentration and charge number on the dust grains.

***Keywords*:** Homogeneous plasma, inhomogeneous plasma, fast mode, slow mode, dust grains

1. INTRODUCTION

In an ordinary plasma in the absence of a magnetic field, the simplest modes are known as ion-acoustic waves and electron plasma waves. However, in the presence of a magnetic field, many more types of waves are found to be observed. It further promises the existence of the other new types of waves if the density inhomogeneity is taken into account. The direction of the magnetic field with respect to the direction of wave propagation makes the characteristics of the waves different from the ones in the absence of a magnetic field. Sometimes, modified modes also occur in such plasma models. There have been experimental [1 - 4] as well theoretical [5 - 15] investigations of the ion acoustic and the solitons in various plasma models. Washimi and Taniuti [5] were the first to show that an acoustic solitary wave could be governed by the Korteweg – de Vries [KdV] equation. Then the effect of ion temperature on such a wave was studied by Tagare [6]; however he focused only on one mode. Nejoh [7] considered a plasma with weakly relativistic ions and investigated the contribution of the ion temperature to the evolution of such waves. In a two-electron-temperature plasma, Tagare [8] made theoretical attempts to study the ion acoustic solitons and double layer but he considered only one mode for his study. However, in a magnetized plasma Malik, [9] form two types of modes that finally evolved as compressive and rarefactive solitons of equal amplitudes. In another study also, two types of modes were found to propagate in a magnetizes, space related plasma where both ions and electrons were taken to have deep relative stakes effects [10]. Other investigations however restricted themselves to a single mode and its evolution as a non linear solitary structure in a magnetized plasma [11 - 13].

1.1 In laboratory plasma or space related plasma such as asteroid zones, planetary rings, cometary tails and in lower part of the Earth's ionosphere dust particles are present which may be either negatively charged [16, 17] or positively charged [18 - 20] due to the currents and emission taking place during the charging process of the dust. Moreover, in a dusty plasmas the dust particles alter the sheath properties appreciably by the charging process and hence the lighter particles energy distribution is changed that can give rise to different temperature distribution [21]. The presence of charged dust component drastically modifies the ion acoustic oscillations [22, 23].

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1.2 In most of the real situations, density in homogeneity and dust particles are present in the plasma. Hence, it is of much importance to investigate different types of possible waves in a inhomogeneous plasma that has heavy dust grains. To the best of our knowledge, this situation has not been considered in the past and therefore, we aim in this article to analyze this problem of interest by including the finite temperature.

2. BASIC FORMULATION AND DISPERSION RELATIONS

We write the equation of continuity, equation of momentum and the posisson's equation considering the plasma as an interpenetrating fluid having ion and electron fluids.

$$\frac{\partial n_i}{\partial t} + \vec{\nabla} \cdot (n_i \vec{v}) = 0 \tag{1}$$

$$m_i n_i \frac{\partial \vec{v}}{\partial t} - n_i e \vec{E} = 0 \tag{2}$$

$$\varepsilon_0 \vec{\nabla} \cdot \vec{E} - n_i e + n_e e + n_d z_d e = 0 \tag{3}$$

$$n_e = n_{e0} e^{(e\phi / K_b T_e)} \tag{4}$$

For one dimensional motion, the above equations read

$$\frac{\partial n_i}{\partial t} + \frac{\partial (n_i v)}{\partial x} = 0 \tag{5}$$

$$m_i n_i \left[\frac{\partial v}{\partial t} + v \frac{\partial v}{\partial x} \right] = -n_i e \frac{\partial \phi}{\partial x} \tag{6}$$

$$\varepsilon_0 \frac{\partial^2 \phi}{\partial x^2} = n_i e - n_e e - n_d z_d e \tag{7}$$

$$n_e = n_{e0} e^{(e\phi / K_b T_e)} \tag{8}$$

For evaluating the mode propagation in the plasma, we consider the following form of the perturbations of density, potential and fluid velocity

$$n_{i1} = n_{i1} e^{i(kx - \omega t)} \tag{9}$$

$$n_{e1} = n_{e1} e^{i(kx - \omega t)} \tag{10}$$

$$\phi_1 = \phi_1 e^{i(kx - \omega t)} \tag{11}$$

$$v_1 = v_1 e^{i(kx - \omega t)} \tag{12}$$

The basic fluid equations are written in their linearized form with the application of the above perturbation. This is at first done in homogeneous plasma.

$$-i\omega n_{i1} + ikn_{i0}v_1 = 0 \tag{13}$$

$$-i\omega m_i n_{i0} v_1 = -in_{i0} ek\phi_1 \tag{14}$$

$$\varepsilon_0 k^2 \phi_1 = n_{i1} e - n_{e1} e \tag{15}$$

$$n_{e1} = n_{e0} \frac{e\phi_1}{k_b T_e} \tag{16}$$

Hence, we obtain the following relations in the first order quantities.

$$v_1 = \frac{\omega}{kn_{i0}} n_{i1} \tag{17}$$

$$n_{i1} = \frac{n_{i0} ek^2}{\left(m_i \omega^2 + 3k_b k^2 T_i\right)} \phi_1 \tag{18}$$

The use of these relations in the basic fluid equation reveals
$(\in_0 \ m_i \ k_b \ T_e \ k^2 + m_i \ n_{eo} \ e^2) \ \omega^2 - \ n_{i0} e^2 k_b k^2 T_e = 0$.

or $a\omega^2 - c = 0$ together with $a = \varepsilon_0 m_i k_b k^2 T_e + m_i n_{e0} e^2$, $c = n_{i0} e^2 k_b k^2 T_e$.

This gives

$$\omega = \pm \frac{\sqrt{n_{i0} e^2 k_b k^2 T_e}}{k_b k^2 \sqrt{\varepsilon_0}} \tag{19}$$

Since the frequency of oscillations cannot be negative, the above equation infers that only one type of mode is possible in a homogeneous plasma. However, in most of the real situations, the plasma has nonuniform density. Therefore, now we derive the dispersion relation in such a realistic plasma. For this, we consider the zeroth order quantities to be the function of space. That is

$$v_0, \emptyset_0, n_{i0}, n_{e0}, n_{d0} \equiv f_0(x)$$

$$\frac{\partial n_{i0}}{\partial t} = \frac{\partial n_{e0}}{\partial t} = \frac{\partial v_0}{\partial t} = 0$$

With this and the similar types of the perturbations, we get the following equations from the basic equations

$$-i\omega n_{i1} + ikn_{i0}v_1 + ikv_0 n_{i1} + n_{i0} \frac{\partial v_0}{\partial x} + v_0 \frac{\partial n_{i0}}{\partial x} + v_1 \frac{\partial n_{i0}}{\partial x} + n_{i1} \frac{\partial v_0}{\partial x} = 0 \tag{20}$$

$$i\omega m_i n_{i0} v_1 = ikn_{i0} e\phi_1 + ikv_0 n_{i1} + n_{i0} e \frac{\partial \phi_0}{\partial x} \tag{21}$$

$$-\varepsilon_0 \frac{\partial^2 \phi_0}{\partial x^2} + \varepsilon_0 k^2 \phi_1 = n_{i1} e - n_{e1} e \tag{22}$$

Hence, we obtain the following dispersion equation

$[(a_1\omega^2 + a_2\omega + a_3) - i(a_4\omega - a_5)]\emptyset_1 = [(b_1\omega^2 - b_2\omega + b_3) - i(b_4\omega + b_5)].$

This equation yields

$$a_1\omega^2 + a_2\omega + a_3 = 0 \tag{23}$$

$$a_4\omega - a_5 = 0 \tag{24}$$

These equations give the following dispersion relations

$$\omega_1 = \frac{-a_2 + \sqrt{a_2^{\,2} - 4a_1a_3}}{2a_1},$$

$$\omega_2 = \frac{-a_2 - \sqrt{a_2^{\,2} - 4a_1a_3}}{2a_1}$$

$$\omega_3 = \frac{a_5}{a_4}$$

.

$$a_1 = m_i n_{i0} \varepsilon_0 k^2 k_b T_e - m_i n_{i0} n_{e0} e^2,$$

$$a_2 = k^3 k_b \varepsilon_0 m_i n_{i0} T_e v_0 + k m_i n_{i0} n_{e0} e^2 v_0$$

$$a_3 = n_{i0}^{\,2} k^2 k_b e^2 T_e$$

Here

$$a_4 = m_i n_{i0} n_{e0} e^2 \frac{\partial v_0}{\partial x} - m_i n_{i0} k^2 k_b T_e \varepsilon_0 \frac{\partial v_0}{\partial x}$$

and

$$a_5 = n_{i0} e^2 k k_b T_e \frac{\partial n_{i0}}{\partial x}$$

These modes will propagate only when the frequency remains positive. This point enables us to get the following condition

$$a_2^{\,2} \geq 4a_1a_3.$$

This condition also means

$$v_0^2 \geq \frac{N_r}{D_r}$$

Here $N_r = 4k^2(k_b k_b)^2\, n_{i0}\varepsilon_0 e^2 - 4k_b T_e n_{io} n_{eo} e^4$

$D_r = m_i\, [\, k^4 (k_b T_e)^2\, \varepsilon_0^2 + 2k^2 k_b T_e \varepsilon_0 n_{e0} e^2 + e^4 n_{e0}^2]$

The other dispersion relations are found to be

$$\omega_4 = \frac{-b_2 + \sqrt{b_2{}^2 - 4b_1b_3}}{2b_1},$$

$$\omega_5 = \frac{-b_2 - \sqrt{b_2{}^2 - 4b_1b_3}}{2b_1}$$

$$\omega_6 = \frac{b_5}{b_4}$$

$$b_1 = m_i n_{i0} \varepsilon_0 k_b T_e \frac{\partial^2 \phi_0}{\partial x^2} + m_i n_{i0} n_{e00},$$

$$b_2 = k k_b \varepsilon_0 m_i n_{i0} T_e v_0 \frac{\partial^2 \phi_0}{\partial x^2} + k m_i n_{i0} n_{e0} e^2 v_0 \phi_0$$

$$b_3 = n_{i0} k_b e^2 T_e \frac{\partial \phi_0}{\partial x} \frac{\partial n_{i0}}{\partial x}$$

$$b_4 = m_i n_{i0} \varepsilon_0 k_b T_e \frac{\partial v_0}{\partial x} \frac{\partial^2 \phi_0}{\partial x^2} - m_i n_{i0}{}^2 e k_b T_e \frac{\partial v_0}{\partial x} - m_i n_{i0} e v_0 k_b T_e \frac{\partial n_{i0}}{\partial x} + m_i n_{i0} n_{e0} e^2 \frac{\partial v_0}{\partial x} \phi_0$$ This means

$$b_5 = -n_{i0}{}^2 e^2 k k_b T_e \frac{\partial \phi_0}{\partial x}$$

Similarly, these modes will propagate in the plasma only when

$$b_2{}^2 \geq 4 b_1 b_3$$

$$v_0^2 \geq \frac{N_r}{D_r}.$$

Where

$$N_r = 4 \left[k_b T_e n_{i0} n_{e0} e^4 \emptyset_0 \frac{\partial \emptyset_0}{\partial x} \frac{\partial n_{i0}}{\partial x} \right]$$

$$D_r = k^2 m_i n_{i0} n_{e0}^2 e^4 \emptyset_0^2$$

3. RESULTS AND DISCUSSION

Our mathematical calculations show that there are several types of modes possible in the plasma. However, based on the nature of the frequency, it is revealed that only two types of the modes propagate in the plasma. This is based on the positive frequency of oscillations. We call these two types of the modes as fast and slow modes based on the magnitudes of their phase velocities. In the forthcoming text, we investigate the propagation characteristics of these modes under the effect of dust density, electron temperature and the charge number on the dust grains. We take the parameters as $\emptyset_0$ = 0.01 V, n_{i0} = $1*10^{18}$ /m^3, n_{e0} = $0.6*10^{18}$ /m^3, $Z_d n_{d0}$ = $0.4*10^{18}$ /m^3, T_e = 3 eV.

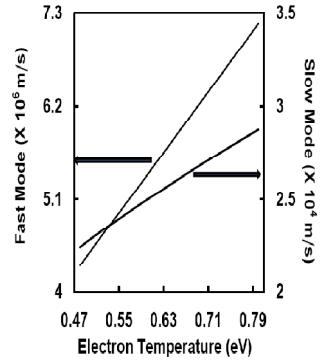

Fig.1- Effect of electron temperature on the phase velocities of fast and slow modes.

It is clear from Fig. 1 that the phase velocities of the fast mode and slow mode get increased with the electron temperature. The enhancement in the velocities for the higher electronics temperature is attributed to the increase restoring force in the presence to thermal motion of electrons. Due to the large restoring force the frequency of oscillations increases that leads to the higher phase velocity of both the modes.

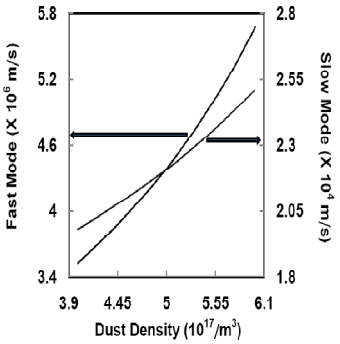

Fig. 2- Effect of dust density on the phase velocities of fast and slow modes.

Figure 2 shows the effect of the dust density of the phase velocities of the fast and slow modes. It is seen here that phase velocities are enhanced if the plasma contains more number of dust grains, Since the dust grains are negatively charged it is obvious that their greater number will cause an increased restoring force. This enhanced restoring force will lead to higher frequency of oscillation and hence the larger phase velocities of the fast and slow modes.

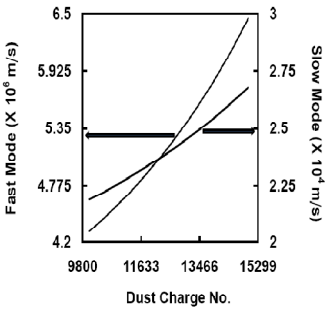

Fig. 3- Effect of dust charge number on the phase velocities of fast and slow modes.

Finally in Fig.3 we show the contribution of dust charge number to the evolution of fast and slow modes in the plasma. It is evident from this figure that these propagate with higher velocities if the dust grains carry more charge. The larger charge on the dust grains will have the same consequence as higher density has on the evolution of the fast and slow modes. Hence, the modes are found to evolve with higher velocities of dust grains having large number of charges.

4. CONCLUSION

Based on our analytical calculations, we can say that a real plasma having negatively charges dust grains supports two types of modes, namely fast and slow modes. It was found that both the modes grow with higher velocities in the presence of higher dust density, higher electron temperature and larger charge of the dust grain.

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THE MELANCHOLIC WORLD OF JOHN KEATS

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ABSTRACT

Melancholy has a close bonding with the philosophers, poets, scholars from the time of Aristotle, Lysander, Ajax, Empedocles, Plato, Socrates etc. Liberating the social limitations, it opens a world of imagination with an aim of creativity. Melancholy in its form of despair, loneliness, solitude is dominant in the writings of Romantic Poets like W.Wordsworth, P.B.Shelly, John Keats and Lord Byron. I firmly believe that for a common man it is not easy to salute the existence of uncertainty, despair or death. But sometimes depressive experiences make a road-map for glorious future of an individual. Everyone has his own sense of melancholy that is always unique to him.
The objective of this paper is to discuss the natural and unnatural aspects of melancholic temperament in the writings of John Keats.

Keywords*:* Melancholy, Indian Philosophy, Imagination, Sensuousness

1. INTRODUCTION

1.1. Melancholy has a long-standing association for genius. It is a concept recognised in all genres of literature. There is a relevant description about despair in W. Shakespeare's *Hamlet*, Act I, Scene II:

> What a piece of work is a man, how noble in reason, how infinite in faculties, in form and moving how express and admirable, in action how like an angel, in apprehension how like a god: the beauty of the world, the paragon of animals—and yet to me, what is this quintessence of dust?

1.2 The influence of society, social strata and surroundings is easily reflected in the writings of any writer. Particularly, the poets, in any age, mostly write about unhappy love, unfulfilled expectations, dissatisfied union, death in life, life in death etc. In this way, they could express about their isolated bent of mind, melancholic mood, surroundings, fear, dejected soul and country life with a beautiful combination with external nature. Thus we become familiar with the melancholic appeal to literature. From the time of the appearance of Robert Barton's 'Anatomy of Melancholy', in 1621, to Byron's 'Childs Harold Pilgrimage' and John Keats's 'Ode to Melancholy', there have been many changing conceptions and expressions of the moods of melancholy.[1] To a great poet, John Milton, 'II Penseroso', the solitary life was all pleasure, and the melancholy mood was not associated with disease, madness, suicide and fear. The eighteenth century inherited melancholic and gloomy mindset from the seventeenth century romanticism. Burton, in his 'Anatomy of Melancholy' sought to analyse the mood for two reasons: to relieve his own gloomy condition and to show others the way out of gloom. He describes the mood as a disease or malady without any apparent cause. It was a "dotage without fever", accompanied by fear, sadness and a general depression of spirits. As to the source of its causes, it might be within the control of the individual beyond his control. [2]

2. MELANCHOLIC MOOD OF JOHN KEATS

2.1 John Keats is regarded as a creature of passion in extremes of tears or outrageous fits of laughter. The impression which young Keats made on his schoolmates was "that of a fiery, generous little fellow, handsome and passionate, vehement both in tears and laughter; and as place able and loveable as he was pugnacious" [3]. John Keats was a "favourite with all" but a moody person whose passion at times was almost ungovernable". [4]. Richard Baxter explains the ways how to avoid solitariness: [5]

> Avoid all unnecessary Solitariness, and be as much as possible in honest cheerful Company. You have need of others, and are not sufficient for your selves: And God will use and honour others as his hands, to deliver us his Blessings…….But keep Company with the more cheerful Sort of the Godly. There is no Mirth like the Mirth of Believers…..… Converse with Men of strongest Faith that have this heavenly Mirth, and can speak experimentally of the Joy of the Holy Ghost; and these will be a great Help to the reviving of your Spirits, and changing your Melancholy Habit so far as without a Physician it may be expected.

2.2 Bonnefoy gives another definition of melancholy, alluding to Keats's nightingale: [6]

> What is melancholy? Deep down, it seems to me, it is a hope at once always being reborn and endlessly disappointed: but less a true desire for a 'true life' than the lack in this desire of a real need to attain satisfaction. The song of the bird is heard, in its 'elsewhere'. You set off towards it, with a map you think you have, and think you like to have. In your mind there is an idea of the place in which you could live and the way you would live there, but this idea is already spelt out, put into words, a conceptual thought, already a simple image and not the actual presence, and it follows that these paths turn, and turn back on themselves, and the person who has taken them has to acknowledge his illusion, an illusion he may well prefer to the 'over there' that he cannot get back to.

2.3 In a letter to Benjamin Baley, John Keats wrote, "After all I do think better of womankind than to suppose they are whether Mister John Keats five –feet high likes them or not." [7] His pessimistic, dejected and melancholic life is well expressed in his sonnets like 'To Solitude', Sleep and Beauty, etc. In 1814, Keats wrote a reflective lyric, 'On Death', which was found in the scrap-book of George Keats for whom it was composed. It was published by Harry Buxton Forman in 1883.

Can death be sleep, when life is but a dream?
And scenes of bliss pass as a phantom by?
The transient pleasures as a vision seem,
And yet we think the greatest pains' to die.
How strange it is that man or earth should roam.
And lead a life of woe, but not forsake,
His rugged path; nor dare he view alone
His future doom, which is but to awake.

2.4 John Keats was much more attached to Byron's juvenile poem 'Hours of Idleness' where Byron's views on melancholy were expressed. In 1883, Keats wrote a sonnet; 'To Byron' that reveals his sentimental melancholy and youthful disillusionment in the developed form of Byron's philosophy.

Byron! how sweetly said thy melody;
Attuning still the soul to tenderness,
As if soft Pity, with universal stress,
Had touch'd her plaintive lute, and thou, being by,
Hadst caught the tones, nor suffered them to die.
O'ershawding sorrow doth not make thee less
Delightful; thou thy griefs dost dress
With a bright halo, shining beamily,
As when a cloud the golden moon doth veil,
Its sides are ling'd with a resplendent glow,
Through the dark robe of it amber rays pre –
Still warble, dying swan! Still tell the tale,
The enchanting tale, the tale of pleasing woe.

2.5 Throughout his student life and career, Keats could not keep his mind on studies and work. Means to say, he had been present in lectures physically, but his heart was with scribbling doggerel rhymes like:

Give me women, wine and snuff,
Until! Cry out, I hold, enough !
You may do so, sans objection,
Until the day of resurrection.

2.6 Frances Winwar describes Keats as having "a head which was to be likened to a study after the Greek masters, a face mobile and sensitive, and a fine, broad – shouldered torso;" but nature had added the short legs of a dwarf. Women turned to look again at the striking youth who passed them in cheap side, and wished him taller. In him, we always find a search for a real woman's love that was probably substituted by imagination .In the second and third stanzas of 'Ode to A Nightingale' he longs for a "drought of vintage". That on the wings of intoxication he might escape from his world of happiness. It seems here, he is in search of a solution for his restless and weary soul.

O for a drought of vintage!
That I might drink, and leave the world unseen,
And with fee fade away into the forest dim.
Fade far away, dissolve and quite forget
What thou among the leaves has never known,
The weariness, the fever, and the fret

Here, where men sit and hear each others groan,
Where palsy shakes a few, sad, and last gray heirs,
Where youth grows pale, and spectre thin, and dies;
Where best to think is to be full of sorrow
And leaden - eyed despairs,
Where Beauty cannot keep his lustrous eyes,
Or new love pine at them beyond tomorrow.

2.7 The elements of melancholy---love for silence, retirement, solitude and loneliness--- have been important factor for the mood of poets particularly the Romantics. Generally, melancholic is a victim who "carries a cloud in his face, never fair weather." Thomas Parnell wrote "Night Piece On Death" in 1721, that also reveals the passion of melancholic poet towards death:

Death's but a path-that must be trod, If man would even pass to God.

2.8 Actually, the above lines talk about his consciousness of painful reality. His Odes prove his experiences and realization of the mutability of beauty; interrelationship between beauty and decay, joy and sorrow, life and death. The melancholy of his poems "arises from an agonised introspection which seeks to plumbs the secret of all life through the strife aspirations of the poets' own soul".

3. ELEMENTS OF SENSUOUSNESS IN JOHN KEATS

3.1 One can easily see the combination of two faculties: sensuousness and rationality in John Keats .His mother was sensuous and emotional, revealing in sensation, going from one extreme to another. His father, on the other hand was rational, and ethical, controlling his impulses and governing his actions in accordance with liberal but firm principles. Keats inherited in a fortunate combination those strongly contrasting characteristics which existed in separation in his parents. In addition to these inherited faculties he possessed a creative imagination, which enabled him to express himself in poetry.

3.2 It seems that spite of having friends of various personalities; John Keats remained as a man of isolation throughout his life. In his moments of despondence and despair, occasionally brought about by the very solitude and sublimity he sought, his friends acted as the emotional anchor that kept him from mental extremes.[Rollins, Hyder E: The Keats Circle: Letters and Papers 1816-1878 Cambridge O.Press 1948 p.46] He had a magical influence on his friends. Fanny Brawne wrote a letter to his sister on 18 September 1820 describing Keats's company: [8]

> I cannot tell you how much every one have exerted themselves for him, norhow much he is liked...I am certain he has some spell that attracts them to him, or else he has fortunately met with a set of friends that I did not believe could exist in this world.

3.3 In the career of John Keats, the influence of Spenser, W.Shakespeare, Hunt, Huzlitt, Addison etc is also very much significant. Though his poetical sensibilities were rooted in the "wonders" of the natural world as it is evident in here:

Ah! Could I tell the wonders of an isle,
That in the fairest lake had placed been,
I could e'en Dido of her grief beguile,
Or rob from aged Lear his bitter teen. (Imitation of Spenser: ll 19-22)

Miriam Allott observes that his life was full of intense activity of senses and brain. Heredity had been over generous with potential problems, and circumstances of life filled his cup of sorrow to overflowing. One can easily observe that his misfortune came quickly, and although his years of maturity were fewer than those of P.B.Shelley and Lord Byron, he probably experienced life more fully and gazed deeper into its mystery than either of the others. The agonies and uncertainty of life became a source of inspiration to him. As an attendant of his dying brother Tom, he felt vicarious experience of human suffering. Alone, winning the phases of life and woefully heart-sick in Italy, John Keats wrote Charles Brown:

> O that something fortunate had ever happened to me or my brothers:- then I might hope,- but despair is forced upon me as a habit.[Keats's Complete Works p.448]

Thus, without fulfilling and realizing his ambitions and reaching the height of his soaring, John Keats died in Italy, February 22, 1821.

4. INFLUENCE OF INDIAN PHILOSOPHY

4.1 Like other poets of the Romantic Age, John Keats was well aware of India and Indian Philosophy. His acquaintance with India is established in the letter written to Miss Jefforey: [9]

> I have the choice, as it were, of two Poisons (yet I ought not to call this a Poison) the one is voyaging to and from India for a few years; the other is leading a feverous life along with Poetry-thus latter will suit me best: for I cannot resolve to give up my studies.

4.2 John Keats seems to be impressed by Indian philosophy especially *the Bhagwad Gita*. His major "Odes" and other works like *Endymion, The Fall of Hyperion* are elaborating the basic concepts of Indian Philosophy. He has also followed philosophy of Metempsychosis. Rober M. Ryan has observed the influence of Indian Philosophy on Keats: [10]

> God's true religion is written in the heart, and Wordsworth, thinking into the human heart, is helping to clarify that religion and to make it triumphant. Milton was not as 'deep' as Wordsworth because he was content with the dogmas and superstitions of Protestantism. Yet in his defence it can be said that he acted and thought as he had to, given the times in which he lived.....In Keats's view, the development of theology and the development of all human thought is presided over and directed by a 'mighty providence' that raises up prophets and reformers in each age to lead mankind toward a purer and a more refined religious consciousness.

5. CONCLUSION

5.1 Describing the cultural inheritance as a cause of Melancholy, Arthur Kleiman argues that because the cultural worlds in which people live are so dramatically different, translation of terms for emotion involves much more than the identification of semantic equivalents. How it feels to grieve or be melancholy in another society leads straightaway into analysis of different ways of being a person in radically different worlds**.** In his work *The Nature of Melancholy*, Radden elaborating Aristotle's *Problemata* (problems) writes:

> Why is it that all men who have become outstanding in philosophy, statesmanship, poetry or the arts are melancholic, and some to such an extent as they are infected by the diseases arising from black bile, as the story of Heracles among the heroes tells? For Heracles seems to have been of this character, so that the ancients called the disease of epilepsy the 'Sacred disease' after him. This is proved by his frenzy towards his children and the eruption of sores which occurred before his disappearance on Mount Oeta; for this is a common affection among those who suffer from black bile.

5.2 We can easily see the presence of melancholy in English Poetry. The poets like W.Wordsworth, P.B.Shelley, John Keats, Lord Byron have shown the sensibility of melancholy in their writings. Their mood becomes gloomy, full of quietness and melancholic with the dominance of imagination, emotion and probably introspection.The world of John Keats is available in his "Odes" and "Letters" proving his spiritual isolation, deep remorse, imagination and hopeless introversion. He propounds the theory of Negative Capability for the realisation of the Supreme Power and to face the reality of materialistic world.

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THROUGHPUT ENHANCEMENT IN IPSec of IPv6

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ABSTRACT

The problem of exhausted addressing space is solved in addition to several improvements are also offered by the Internet Protocol version 6 (IPv6) over current Internet Protocol version 4 (IPv4) in diverse fields such as routing concepts, flows and traffic control, the neighbor discovery, mobile IPv6 and the network security architecture. For providing the backward compatibility transition mechanisms, such as dual stacks and the 6bone were also offered. One of the major feature offered by IP next generation (IPng) was the obligatory IPSec. IPSec is provided by attaching the headers such as Authentication Header and/or Encryption Security Payload Header. By attaching these headers Data integrity, Data confidentiality and Data origin authentication is guaranteed. Thus for sensitive data IPSec is a must feature. One of privileged feature of IPSec is that being applied at the IP layer of TCP/IP it automatically provides security to the upper layers of suite and sometimes even to IP layer also which depends on the mode of IPSec. This paper discusses the concept of IPng and its security feature and also suggests the technique for the improvement of performance of the IPSec by splitting the Security Policy Database used for the implementation of IPSec and then an analysis of the effect of this split on the performance is discussed.

Keywords: IPSec, SHA, MD5, SAbundle, IETF and VPN.

1. INTRODUCTION

1.1 Exhausting Address Space Problem

Due to radical boost in the internet users there is an apparent exhaust of the available IP addresses in the contemporary Internet protocol that is IPv4. The addressing scheme of 32 bit limits the number of addresses to 4,294,967,295 which seemed to be adequate back then. But through bad address circulation and a shortsighted idea of how much the internet will grow, addresses are near to exhaustion now.

1.2 Internet Protocol Version 6

There have been some approaches to the issue discussed above like a tighter control by Regional Internet Registries, network renumbering, DHCP, NAT and of course the introduction of IPv6. IPv6 is the next implemented version of IPv4 and provides several extra services predominantly in the areas of security, network scalability and quality of service. The workgroup developing this new version of the protocol determined that the address size should be expanded from the 32-bit addresses of IPv4 to 128-bit addresses. It is hoped that this will endow with enough addresses for all manner of Internet connected devices for the foreseeable future: mobile phones, pocket PCs, printers, scanners, routers, fridges, toasters etc.

1.3 Internet Protocol Security (IPSec)

IPSec is a skeleton of open standards developed by the Internet Engineering Task Force (IETF). IPSec provides safety measures for transmission of perceptive information over vulnerable networks such as the Internet. IPSec acts at the network layer, protecting and authenticating IP packets between participating IPSec devices ("peers"). IPSec provides the following network security services. In general, local security policy will dictate the use of one or more of these services:

- **Data Confidentiality:** The IPSec sender can encrypt packets before transmitting them transversely a network.
- **Data Integrity:** The IPSec receiver can authenticate packets sent by the IPSec sender to guarantee that the data has not been tainted during broadcast.
- **Data Origin Authentication:** The IPSec receiver can authenticate the source of the IPSec packets sent. This service is dependent upon the data integrity service.
- **Anti-Replay:** The IPSec receiver can perceive and reject replayed packets.

**** Corresponding Author***

2. IPSec FOR IPv6

The IPSec in IPng can be configured in two modes these are transport and tunnel mode. The former secures upper layer data and some of the fields of IPv6 header which are defined before the security header. The later provides more secure communication by shielding all the upper layers plus the IP layer also. IPSec in IPv6 is provided by appending the expansion header of security to the IP header. These IPSec headers are of two types namely Encrypted Security Payload (ESP) and Authentication Header (AH). The aforementioned provides extra attribute of confidentiality all the way through encryption then the later one which only provides authentication and anti reply.

2.1 IPSec Terminology

Following are some significant IPSec terminologies, which would help to comprehend the concept of IPSec:

- **Authentication:** One of the functions of the IPSec framework. Authentication establishes the integrity of datastream and ensures that it is not tampered with in transportation. It also provides confirmation about datastream foundation.
- **Certification Authority (CA):** A third-party entity that is accountable for issuing and revoking certificates. Each device that has its own credential and public key of the CA can authenticate every other device within a given CA's province. This term is also applied to server software that provides these services.
- **Crypto map:** A software configuration entity that performs two primary functions:
  i. It selects data flows that necessitate security dispensation.
  ii. Defines the approach for these flows and the crypto peer that traffic needs to go to. A crypto map is functional to a boundary. The concept of a crypto map was introduced in classic crypto but was lengthened for IPSec.
- **Data integrity:** Data integrity mechanisms, through the use of secret-key based or public-key based algorithms, which allow the recipient of a piece of protected data to verify that the data has not been modified in transit.
- **Data confidentiality:** Method where protected data is manipulated so that no attacker can read it. This is commonly provided by data encryption and keys that are only available to the parties involved in the communication.
- **Data origin authentication:** A security service where the receiver can verify that protected data could have originated only from the sender. This service requires a data integrity service plus a key distribution mechanism, where a secret key is shared only between the sender and receiver.
- **Data Encryption Standard (DES):** The DES was published in 1977 by the National Bureau of Standards and is a secret key encryption scheme based on the Lucifer algorithm from IBM. The contrast of DES is public-key. Cisco uses DES in classic crypto (40-bit and 56- bit key lengths), IPSec crypto (56-bit key), and on the PIX Firewall (56-bit key).
- **Diffie-Hellman:** A method of establishing a shared key over an insecure medium. Diffie-Hellman is a component of Oakley (see definition below).
- **Hash:** A one way function that takes an input message of arbitrary length and produces a fixed length digest. Cisco uses both Secure Hash Algorithm (SHA) and Message Digest 5 (MD5) hashes within our implementation of the IPSec framework (see HMAC below).
- **HMAC:** A mechanism for message authentication using cryptographic hashes such as SHA and MD5. For an exhaustive discussion of HMAC, refer to: RFC 2104.
- **Internet Key Exchange (IKE):** A hybrid protocol that uses part Oakley and part of another protocol suite called SKEME inside the Internet Security Association and Key Management Protocol(ISAKMP) framework. IKE is used to establish a shared security policy and authenticated keys for services (such as IPSec) that require keys. Before any IPSec traffic can be passed, each router/firewall/host must be able to verify the identity of its peer. This can be done by manually entering pre-shared keys into both hosts, by a CA service, or the forthcoming secure DNS (DNSSec). This is the protocol formerly known as ISAKMP/Oakley, and is defined in RFC 2409: The Internet Key Exchange (IKE). A potential point of confusion is that the acronyms "ISAKMP" and "IKE" are both used in Cisco IOS software to refer to the same thing.
- **Internet Security Association and Key Management Protocol (ISAKMP):** A protocol framework that defines the mechanics of implementing a key exchange protocol and negotiation of a security policy. ISAKMP is defined in the Internet Security Association and Key Management Protocol (ISAKMP).

- **Message Digest 5 (MD5):** A one way hashing algorithm that produces a 128-bit hash. Both MD5 and Secure Hash Algorithm (SHA) are variations on MD4, which is designed to strengthen the security of this hashing algorithm. SHA is more secure than MD4 and MD5. Cisco uses hashes for authentication within the IPSec framework.
- **Oakley:** A key exchange protocol that defines how to acquire authenticated keying material. The basic mechanism for Oakley is the Diffie-Hellman key exchange algorithm. Refer to: RFC 2412: The OAKLEY Key Determination Protocol.
- **Replay-detection:** A security service where the receiver can reject old or duplicate packets in order to defeat replay attacks (replay attacks rely on the attacker sending out older or duplicate packets to the receiver and the receiver thinking that the bogus traffic is legitimate). Replay-detection is done by using sequence numbers combined with authentication, and is a standard feature of IPSec.
- **RSA:** A public key cryptographic algorithm (named after its inventors, Rivest, Shamir and Adleman) with a variable key length. RSA's main weakness is that it is significantly slow to compute compared to popular secret-key algorithms, such as DES. Cisco's IKE implementation uses a Diffie-Hellman exchange to get the secret keys. This exchange can be authenticated with RSA (or pre- shared keys). With the Diffie-Hellman exchange, the DES key never crosses the network (not even in encrypted form), which is not the case with the RSA encrypt and sign technique. RSA is not public domain, and must be licensed from RSA Data Security.
- **Security Association (SA):** An instance of security policy and keying material applied to a data flow. Both IKE and IPSec use SAs, although SAs are independent of one another. IPSec SAs are unidirectional and they are unique in each security protocol. A set of SAs are needed for a protected data pipe, one per direction per protocol. For example, if there is a pipe that supports ESP between peers, one ESP SA is required for each direction. SAs are uniquely identified by destination (IPSec endpoint) address, security protocol (AH or ESP), and security parameter index (SPI). IKE negotiates and establishes SAs on behalf of IPSec. A user can also establish IPSec SAs manually. An IKE SA is used by IKE only, and unlike the IPSec SA, it is bi- directional.
- **Secure Hash Algorithm (SHA):** A one way hash put forth by NIST. SHA is closely modeled after MD4 and produces a 160-bit digest. Because SHA produces a 160-bit digest, it is more resistant to brute-force attacks than 128-bit hashes (such as MD5), but it is slower.
- **Transform:** A transform describes a security protocol (AH or ESP) with its corresponding algorithms. For example, ESP with the DES ciphers algorithm and HMAC-SHA for authentication."

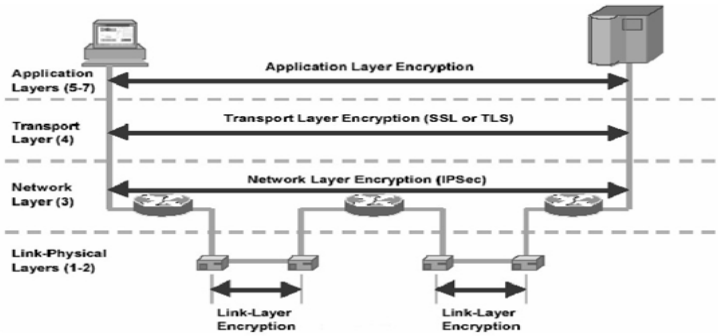

Figure 1: Encryption Options at Different layers of Protocol Suite

IPSec is one of the protocols that offer data encryption services. The other protocols are Secure Socket Layer (SSL) and Transport Layer Security (TLS). The difference is that SSL and TLS secure the application/transaction at the transport layer. TLS is the open standards version of Netscape's SSL. Where, IPSec secures the pipe at the internet or network layer (layer 3 of the OSI layer) between the IP addresses. All the encryption options at different layers of the Protocol suite are depicted in Figure 1.According to the Internet Engineering Task Force (IETF), IPSec is "a security protocol in the network layer will be developed to provide cryptographic security services that will flexibly support combinations of authentication, integrity, access control, and confidentiality."

3. IPSec SECURITY PROTOCOLS

To perform its security services, IPSec uses the following two security protocols: Authentication Header (AH) and Encapsulation Security Payload (ESP). The outline of the IPV6 IPSec packet format is shown in Figure2.

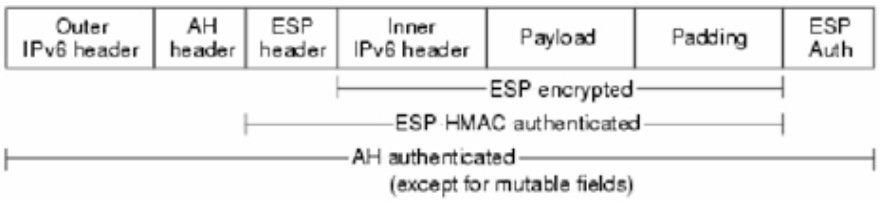

Figure 2: IPv6 IPSec Packet Format

3.1 Authentication Header

The AH security protocol provides data origin authentication, connectionless integrity, and optional replay-detection services. AH protocol provide strong cryptographic authentication for IP traffic to ensure that, packets that are altered, will be detected, but AH does not encrypt the packets it protects. The location of the AH header depends on the mode operation of AH, where there are actually two modes of operation: transport and tunnel mode.

3.2 Encapsulating Security Payload

ESP is a security protocol that provides data confidentiality, limited traffic flow confidentiality, data origin authentication, and replay-detection services. It is designed to improve the security of IP. As it is listed before, it basically offers similar services provided by AH, with two additional services, which includes data confidentiality (datagram encryption services) and limited traffic flow confidentiality. Similar to AH, there are actually two modes of ESP, which determine the location of ESP in the packets.

3.3 IPSec Modes

Generally, there are two modes supported by IPSec:

3.3.1 Tunnel Mode

Which is applied to the IP tunnel, where the outer IP header specifies the next IPSec processing destination, and the inner IP header specifies the real packet destination. The packet format in tunnel mode is shown in Figure 3.This is mostly used to provide secure connections between gateways.

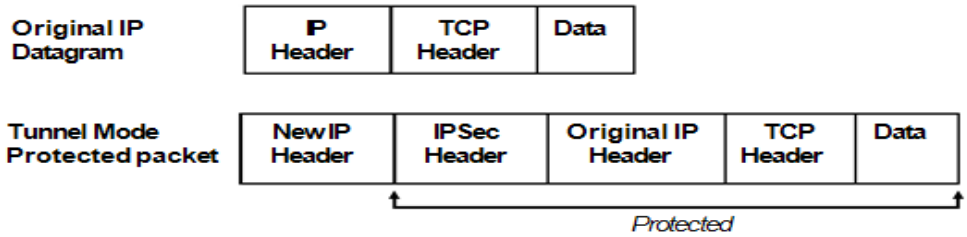

Figure 3: Packet Format in Tunnel Mode

3.3.2 Transport Mode

This is applied between the two hosts. Here, the IPSec header is placed between the IP header and the TCP/UDP header. Figure 4 depicts the packet format in Transport mode. Commonly used for secure connection between end-stations.

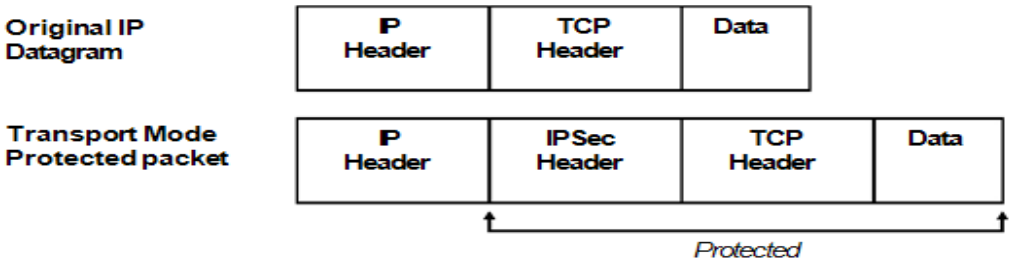

Figure 4: Packet Format in Transport Mode

3.4 IPSec TECHNOLOGY

Basically, any data that is going to the public network must go through an IPSec gateway, in which the data will be encrypted, and it will be decrypted by the other intended IPSec gateway at the other end.

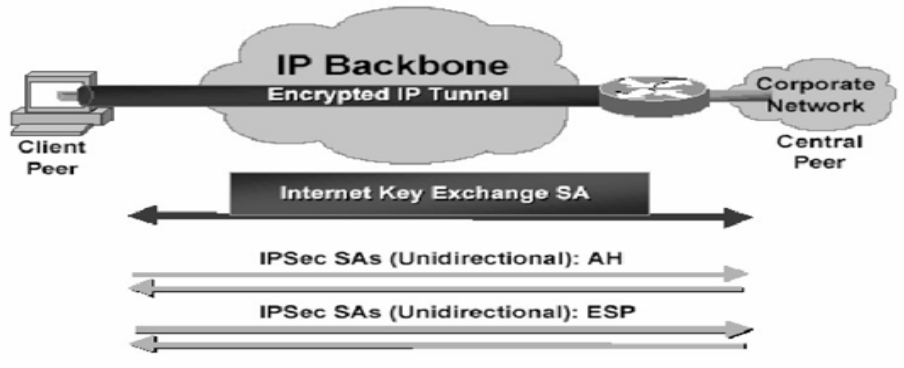

Figure 5: IPSec Channels Overview

As shown above in Figure 5, IPSec VPN traffic usually consists of two channels between the endpoint peers, which are: an internet key-exchange channel where all the authentication and encryption key information is passed, and the other is the data channels where all the real data are being transmitted. The key-exchange channel uses standard UDP connection to and from port 500, where the data channels use IP protocol number 50 (ESP).

4. IPSec IMPLEMENTATION

The IETF be the one who urbanized IPSec protocols, which is presently being worldwide implemented with IPv4. Enhanced than that, the IPSec protocols have been urbanized so that it would be able to be implemented with the subsequent generation Internet Protocol, which is IPV6. IPSec can be implemented in many applications, such as in keeping a protected VPN communication tunnel among diverse LANs through the civic internet services, also giving the capability for a mobile employee to be firmly associated to the company's private VPN by means of remote access services. The foremost prerequisite for the VPNs to be associated is that mutually IPSec gateways must be associated to the internet and those gateways know each other's network configurations. With those two requirements met, an IPSec tunnel is repeatedly established amid those two private LANs. Note that there can be more than just one IPSec tunnels to be formed, to make associations for more than two LANs.

Open Source execution of IPSec and IKE for Linux is the Linux FreeS/WAN, where quite a few companies are co-operating in the sheltered Wide Area Network (S/WAN) project to assurance that products will interoperate. It must be admitted that IPSec provides one of the uppermost security level (higher than MPLS), which is presently obtainable in VPN technology. One drawback of IPSec is that it fallout in quite a quantifiable effect on the network's latency and throughput. This is not the case for MPLS. It is practicable that the grouping of the two protocols, MPLS and IPSec, would results in the best security that can be achieved for VPNs communication technology today.

SPD specifies the security policies involved in the transmission of inbound and outbound packets. By security policies it means which particular

- IPSec protocol (ESP, AH or Both)
- IPSec mode (Transport or Tunnel) and
- IPSec processing (Apply, Bypass or Drop)

will be used for packet transmission to a particular host or range of addresses of different participant hosts. Thus in SPD, there exists entries for the particular host addresses and wildcards for the range of addresses with their policies. In our research we have shown the IPSec communication between three IPv6 hosts say Host-ABC, Host-PQR and Host-XYZ. For the simplicity and without loss of any generality we assumed host IP addresses of Host-ABC, Host-PQR and Host-XYZ as 1:2:3:4:5:6:7:8, 1:2:3:4:5:6:7:9 and 1:2:3:4:5:6:7: A respectively. Here the policy numbers 1 and 2 are for the HTTPS [2] communication between Host-ABC and Host-PQR which tells that the IPSec protocols ESP-AH are used for SAbundle. Policy number 3 is for all other communication going between these two hosts, which tell that ESP is used for this communication. Policy numbers 4, 5 and 6 are for all the communication going on between Host-ABC and Host-XYZ, which tells that all the communication uses AH-ESP-AH for SAbundle.

In this section, the performance of the anticipated database is compared with that of existing Security Policy Databases. For straightforwardness, we have implicit that all the hosts broadcast data to further hosts or loopback by means of a explicit SA bundle i.e. no diverse SA bundles are being defined for the diverse port addresses. We can make a note of here that all hosts have some number of security policies for other hosts together with its own loopback.

Let us presume k_{ij} be the number of i^{th} host policies for j^{th} host where j may be same as i and n be the total number of hosts.

RS_{bs}, the number of records scanned in SPD at i^{th} host for all hosts before split can be given as

$$RS_{bs} = \sum_{j=1}^{n} k_{ij}$$

Likewise, RS_{as} is the number of records scanned in both SPD_PRIMARY and SPD_SECONDARY at i^{th} host for all hosts after split can be given as

$$RS_{as} = n$$

In view of the fact that searching in the SPD_SECONDARY never takes more than O(1) time as a reference to it is made from SPD_PRIMARY.

By taking into consideration here only two policies for each host, the above parameters, RS_{bs} and RS_{as}, are plotted against different number of hosts in **Figure6.** The difference can easily be marked for RS_{as} over RS_{bs}

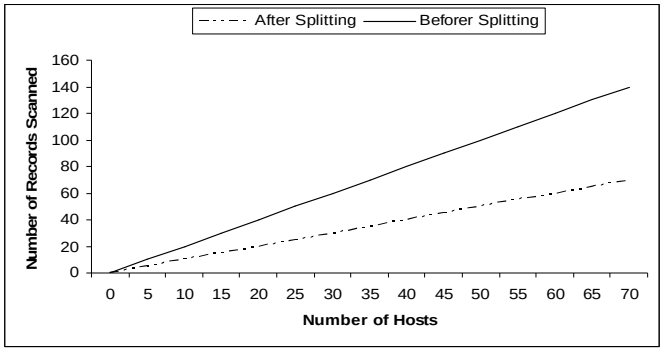

Figure 6: Comparison of Number of Records Required Being Scanned Before and After Split

4.1 Performance Evaluation of IPSec

IPSec provides Data privacy, Data reliability, Data Origin verification, Anti-Replay. With all these services it is also significant to see the presentation problem which usually degrades Mega-bits transferred per second as compared to packet broadcast exclusive of IPSec [4]. This is quite noticeable because of dispensation of extra bits desired to assurance security. In IPSec, the user, who desires to ascertain the secure connection, decides the policies for the other hosts. After that the Security Association (SA) or Security Association Bundle (SA Bundle) with the other hosts is usually made [8]. Supplementary, a number of keys are also to be generated using Internet Key Exchange (IKE) or some additional protocols for allotment among the hosts [1]. It can be pointed out here that for defining policies and making these security associations one requires two databases namely Security Policy Database (SPD) and Security Association Database (SAD) [8]. All these responsibilities necessitate dispensation and thus degrade the performance of packet transmission; this disgrace is shown in Figure 7.

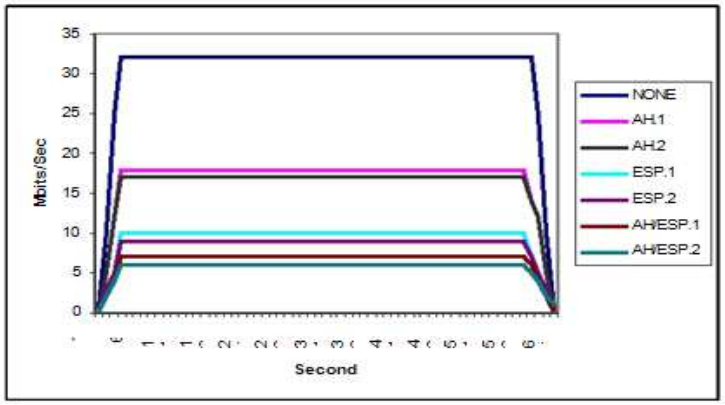

Figure 7: Performance of data transmission using IPSec (MBytes)

5. CONCLUSION

IPSec can be measured as the standard sets of protocols for implementing protected connections and encryption key exchange amid computers over a public IP network. It is also by now the standards for privacy, integrity, and authenticity for networked commerce. The two key technologies supported by IPSec are: data encryption, which provide data security. It prevents unlawful interpretation of packet contents. The second one is authentication which provides data integrity. This technology ensures that the packets are from the right sender and have not been altered in transit.

In this segment a splitting procedure for Security Policy Database has been discussed. It turns out from the above discussion that the proposed splitting methodology not only reduces the search time in SPD to a great extent but also reduces the space requirement so that maintenance of the

Security Policy Database becomes easier. In this respect, we can conclude here that since it happens for each and every packet during transmission/reception, the overall performance of IPSec processing can be enhanced significantly.

6. FUTURE ASPECTS

This paper presents a procedure to amend the existing security strategy database. It is also seen that this split has a substantial enhancement in the space and time complexities associated with the database operations. Finally there is a prospect scope of accomplishment of this split of SPD into IPSec. Thus by this accomplishment one can also evaluate performance (in term of Mbits/sec) of IPSec with split SPD to that of the conventional SPD.

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LEAN APPROACH - A NEW SUCCESS MANTRA FOR INSTITUTES

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ABSTRACT

Change is only constant in life. Be it business, culture, and education everywhere the change is happening in our country. The new found economic growths have witnessed a sea change in our approach to managing the business. The society has changed and so the education need has changed. Today, the education need has become broad based and essential. The institutes responsible for addressing these needs are also undergoing the churn of change, largely to meet their survival and growth ambitions. The twin challenge has led the institutes to look at the possibilities of introducing a practice of "LEAN APPROACH" as their management mantra. This paper illustrates how the "Lean Approach" method can be institutionalized for engineering colleges to meet its ambitions.

Keywords: Lean approach, Goal, Vision, Mission, Purpose

1. INTRODUCTION

The trend, relying on government for each and every problem, is over. Government is slowly and slowly shifting its responsibilities to the civil society to take care of its own woes. This is leading to the multitudes of organizations coming up with one solution or other for the problems of the civil society, leaving it slightly unorganized and confused to the level of brinkmanship. In this situation some of the organization due to its own weight are either leaning towards decline or declining without realizing what is responsible for its state of affairs. The management of engineering institutes needs to be careful about constantly changing business environment and their impact on the institute. Accordingly Institutes must apply modern methods to arrest the problem and then thinking of applying the right solutions. The "Lean Approach" method is one such method which has been tried in industry scenario with considerable success. This paper discusses the how "lean approach" method is applied for the engineering institute problems.

2. CURRENT SCENARIO

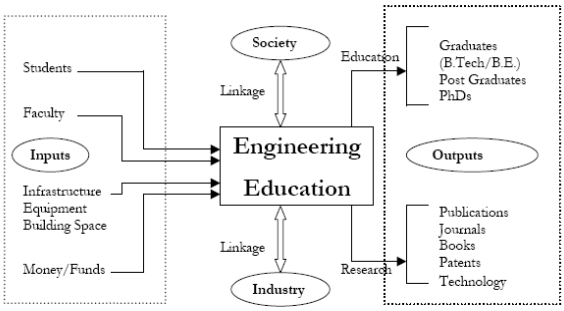

Figure -1 Engineering Education System in India

Engineering education in India is structured as per the above diagram. Around 75% of the engineering colleges have come up in private sector in India since globalization drive has taken place. A large number of engineering colleges which were running under government control has been made autonomous. Therefore management of these (private or public) colleges will have to run on the cash generated out of the student's fees or the grants given by various bodies like AICTE / UGC or Industry.

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In order to compete, survive and thrive in the open market the institutes will have to cater to changes in the business environment such as

- The globalization of education and rapid flow of information, new products, materials and technologies into the education institutes
- The technological innovations and their effect on the current operations and management
- The increased competition is demanding higher quality of education at lower costs
- Quick response to the changes in the Industry scenario as a pull factor.

The institutes in order to address competitive growth will have to focus on the management and control of its deliverables. The absence of clear standards and ratings for the institutes makes the task more confusing. At times these could lead to doing things which are not necessarily adding values to the institute's reputation or leading to the competitive advantage. Which is why it could lean towards the decline of the institute rather than growth? This establishes a clear-cut need for a framework which when applied to the institutes will arrest its decline and eventually lead to value addition and success. Applying "Lean Approach" framework in managing the institute affairs will provide better results for the institute. This could arrest the declining of its growth and streamline its operations for success.

2.1 What is the "Lean Approach"?

Lean approach is "Systematic approach to identifying and eliminating WASTE (non value added activities) thru continuous improvement by flowing the product or services at the pull of the customer in pursuit of higher quality".

2.2 What is the WASTE?

WASTE is "Anything other than the minimum amount of equipment, material, parts, space and worker's time which are absolutely necessary to add value to the strategic goal".

3. FOLLOWING THE LEAN APPROACH METHOD

The actors in the lean approach implementation are

3.1 The Institute Management

Most of the institute has their vision and mission spelt out. These vision and mission needs to be related to purpose, objectives of the institute. Goal setting values are identified for these objectives. The goal setting value has been arrived at by keeping in mind the institute objective in place, and how much should be our growth targets with respect to each objective (keeping in mind the current position on infrastructure, deliverables etc as a baseline). Once these are established then a balance scorecard is prepared to measure the performance of the institute based on the department's status report on the action list prepared by each department of the institute. For example

VISION	MISSION	PURPOSE	OBJECTIVES	GOALS
Institute's vision is to impart quality, world class education to engineers and give growth and direction to the seekers of learning.	Institute is absolutely committed to serve the society and improve the mode of life by imparting high quality education in the field of Engineering and Management catering to the explicit and implicit needs of the students, college, society, humanity and industry by encouraging higher level of participation in research, live projects, consultancy and industrial interaction.	Institute purpose is to become independent, profitable, most reputed, #1 institute in university and in the region at large synchronizing with our institute's objectives.	Satisfied Students	80 % Student gives "A" in student survey 90% students gets placed in campus interviews
			Satisfied Staff	90% staff gives "A" in staff survey 90% Staff retention by the department
			Deliverance in quality education	100% compatibility with course
			Rise in Research Activities	35% rise in R&D activity every year
			Industry-Department Relation	50% rise in industry program every year
			High Level Projects and Consultancy	To envolve 90% students in consultancy, seminar & Conferences 50% students publish paper and articles
			Equal opportunity Employer	***100% students must increase their knowledge and skill by doing in-house project work***

Figure-2 Vision, Mission turned into strategic goals

The management will receive periodic status report from the departments to map its strategic plans moving in right direction or it needs a change based on the periodic evaluation of changed scenario.

3.2 The Departments and Their Staff

The goal setting by the management of the institute moves to the respective department. These goal settings are updated by departments drive for new opportunities and core strengths. The lean processes like "5S program eliminating waste" are applied to achieve the goals.

5S program eliminating waste are as follows:-
Seiri-Sort → Sorting through the elements and tools that are not needed for a specific process.
Seiton-Straightening → Straightening out the tools that are needed, creating an easily accessible and highly functional tool layout.
Sieso-Shine → Clean equipment/tools and the entire working area (cell). Creating a friendly working environment.
Sieton-Spread → Constantly keeping and improving the work area spread out in order to avoid chaos.
Shitsuke-Standardize → Believing in and relying on the system. The new rules and regulations should become accepted disciplined methods or even new habits.

NOTE – SAFETY has been added as 6S

3.2.1 The Faculty
Based on the lean process selected the list of action items for the teaching staff to follow are prepared. An exercise is instituted to see if any WASTE activity has crept into the list of action items.

3.2.2 The Non-Teaching Staff
Based on the lean process selected the list of action items for labs or classroom support for non-teaching staff to follow is prepared. An exercise is instituted to see if any WASTE activity has crept into the list of action items.

3.2.3 The Students
Since the students are the recipients of these action items therefore it will be prudent to involve them in their execution so that new WASTE activities are not created.

3.2.4 The Department
The comprehensive list of action items is prepared. The GAP analysis between department's goal settings and their performance is measured and reported to the management periodically.

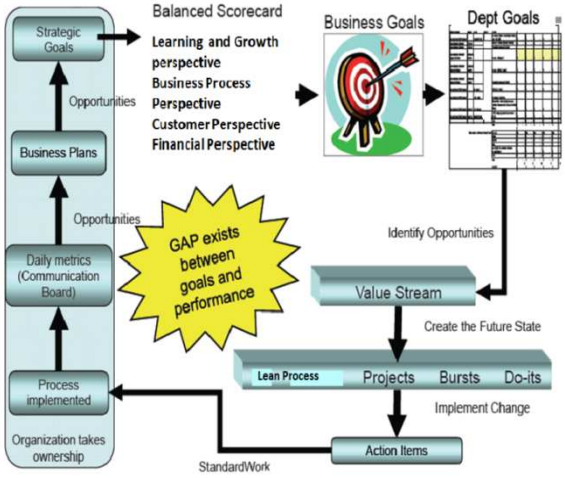

Figure-3 Finding WASTE activities and eliminating them

4. CONCLUSION

Thus we see that if the institute follows the "Lean Approach" method then they can easily save on their resources used for the WASTE activities for the institute and use them for their goal oriented activities. Summarizing the steps for the "Lean Approach" method is as follows –

- Systematically identify WASTE activities in the system and eliminate them
- Reduce red tape, unwanted bureaucratic hurdles
- Simple governance structure to follow clear processes with few surprises
- Create risk management processes to eliminate crisis situations
- Create awareness and cross train stakeholders, management and staff

These steps are simple to implement and can bring rich dividends. The institutes can definitely stride to achieve growth and can excel in competitiveness.

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AN ELECTRONIC EVOLUTION IN LOGIC AND COMPUTATION

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ABSTRACT

The microprocessor is one of those rare innovations that simultaneously cuts manufacturing costs and adds to the value and capabilities of the product. As a result, the microprocessor has invaded a host of existing products and created new products never before possible. This single invention revolutionized the way computers are designed and applied. It put intelligence into "dumb" machines and distributed processing capability into previously undreamed applications. The paper illustrates the history of different generation microprocessors and their market competency. Moores' Law had already predicted the trends of future technologies. Based on extrapolation of past trends and on examination of technologies under development, it is predicted that the processing power and memory capacity necessary to match general intellectual performance of the human brain and the required hardware will be available in cheap machines by 2020s.

Keywords — SIMD (single-instruction, multiple data), EPIC (explicitly Parallel Instruction Computing), IBM (International Business Machines), EDVAC (Electronic Discrete Variable Automatic Computer), ENIAC (Electronic Numerical Integrator and Computer), SPC (Stored Program Concept), NUMA (Non-Uniform Memory Access), MSW (Machine Status Register), Memory Management Unit (MMU), BIST (Built-In-Self-Test), MIPS (Million Instructions per Second), TLP (Thread-Level Parallelism), CMP (Chip-level Multiprocessing).

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1. INTRODUCTION

From the earliest times the need to carry out calculations at huge speed and great accuracy has been developing and it has culminated in the modern Microprocessor. If we take a look around us, we would be sure to find devices such as digital wrist watches, pocket calculators, microwaves, cars, toys, security systems, navigation and credit cards which use a microprocessor in some form or the other. Microprocessors have become a part of our daily lives and it would be difficult to imagine life without them today [1] & [2]. Microprocessors are ubiquitous.

1.1 The first steps involved in the development of counting and calculation aids were the counting board and the Abacus. Pascal (1623-62) was the son of a tax collector and a mathematical genius. He designed the first mechanical calculator (Pascaline) based on gears. It performed addition and subtraction. Leibnitz (1646-1716) was a German mathematician and built the calculator (Stepped Reckoner) to do multiplication and division using a stepped cylindrical gear. It was not reliable due to the required accuracy of contemporary parts [3].

1.2 Charles Babbage (1792-1872) was a British inventor who designed an 'analytical engine' incorporating the ideas of a memory and card input/output for data and instructions. Again the current technology did not permit the complete construction of the machine. Babbage is largely remembered because of the work of Augusta Ada (Countess of Lovelace) who is probably the first computer programmer. Burroughs (1855-98) introduced the first commercially successful mechanical adding machine of which a million were sold by 1926. Hollerith developed an electromechanical punched-card tabulator in 1889 to tabulate the data for 1890 U.S. census. Data was entered on punched cards and could be sorted according to the census requirements. The machine was powered by electricity. He formed the Tabulating Machine Company which became IBM. Aiken (1900-73) a Harvard professor with the backing of IBM built the Harvard Mark I computer (51ft long) in 1944. It is based on relays (which operate in milliseconds) as opposed to the use of gears. It required 3 seconds for a multiplication. Eckert and Mauchly designed and built the ENIAC in 1946 for military computations. It used vacuum tubes (valves) which were completely electronic (operated in microseconds) as opposed to the relay which is electromechanical.
It weighed 30 tons, used 18000 valves, and required 140kw of power. It was 1000 times faster than the Mark I multiplying in 3 milliseconds. ENIAC was a decimal machine and could not be programmed without altering its setup manually. Atanasoff had built a specialized computer in 1941 and was visited by Mauchly before the construction of the ENIAC. He sued Mauchly in a case which was decided in his favour in 1974.

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1.3 Von Neumann was a scientific genius and was a consultant on the ENIAC project. He formulated plans with Mauchly and Eckert for a new computer EDVAC which was to store programs as well as data. This is called the stored program concept and Von Neumann is credited with it. Almost all modern computers are based on this idea and are referred to as Von Neumann machines. He also concluded that the binary system was more suitable for computers since switches have only two states. He went on to design his own computer at Princeton which was a general purpose machine. Alan Turing was a British mathematician who also made significant contributions to the early development of computing, especially to the theory of computation. He developed an abstract theoretical model of a computer called a Turing machine which is used to capture the notion of computable i.e. what problems can and what problems cannot be computed. Not all problems can be solved on a computer.

2. INTEL ERA

The invention of Transistor at Bell Labs in 1947 and subsequent development in 1950 revolutionized the development of computers. Transistors were much smaller, more rugged, cheaper to manufacture and proved to be far more reliable than valves. Core memory was introduced and disk storage was also used. The hardware became smaller and more reliable, a trend that still continues. In 1957 Japan's Electro-technical Laboratory developed a transistor computer, the ETL Mark III that used 130 transistors and 1,700 diodes. On July 30, 1959 Robert Noyce and Gordon Moore filed a patent application for Integrated Circuit technology on behalf of the Fairchild Semiconductor Corporation and in the same year Jack Kilby at Texas Instruments designed a flip-flop IC. In 1964 with a speed of 9 megaflops, Control Data Corp's CDC 6600 designed by Seymour Cray, claimed the title of first commercially successful supercomputer. In 1968, B2500 and B3500, the first computers to incorporate integrated circuits were introduced by Burroughs. In 1968 Intel Company started with 12 people in a single room and first year revenues were $2672. Intel co-founder Gordon Moore is well known for his prediction on growth of IC technology called Moore's Law [4].

Intel 4004 is the world's first commercially available microprocessor. In 1971 the team of Ted Hoff, S. Mazor and F. Fagin developed the Intel 4004 microprocessor a "computer on a chip". This breakthrough invention powered the Busicom calculator paved the way for embedding intelligence in inanimate objects as well as the personal computer. Hoff and fellow engineers came up with a design that involved four chips: a CPU chip, a ROM chip for the custom application programs, a RAM chip for processing data, and a shift register chip for input/output (I/O) port. The CPU chip, though it then had no specific name, was eventually called as microprocessor. Measuring one-eighth of an inch wide by one-sixth of an inch long and made up of 2,300 MOS transistors, Intel's first microprocessor was equal in computing power to the first electronic computer, ENIAC, which required a space of 3000 cubic feet with 18,000 vacuum tubes. The 4004, as it was to be called, would execute 60,000 operations a second, with by today's standards is primitive. It works at a clock rate of 108 KHz.

Intel 8008 The 8-bit 8008 microprocessor had been developed in tandem with the 4004 and was introduced in April 1972. It was intended to be a custom chip for Computer Terminals Corp. of Texas. But as it developed, they rejected the 8008 because it was too slow for the company's purpose and required too many supporting chips. However, Intel offered the 8008 on the open market, where its orientation to data/character manipulation versus the 4004's arithmetic orientation caught the eye of a new group of users. The 8008 was made up of 3,500 MOS transistors and could work at a clock rate of 200 KHz.

Intel 8080 It soon became obvious to Intel and its competitors that there were almost limitless number of applications for microprocessors. A big advance came in 1974 with Intel's 8080 chip, the first true general purpose microprocessor. It is much more highly integrated chip than its predecessors, with about 10 times the performance. It could execute about 290,000 operations a second and could address 64K bytes of memory. Both the 4004 and 8008 utilized the P-channel MOS technology, whereas the 8080 used the innovative N-channel MOS process yielding vast gains in speed, power, capacity and density. It consisted of 60,000 transistors and worked at clock rate of 2 MHz.

Intel 8085 In 1976 Intel came up with an improved version of 8080 which was called 8085. It could work on a single 5V-power supply, with faster speed and integrated more functions. It consisted of 6,500 MOS transistor and could work at clock rates of 3 to 5MHz.

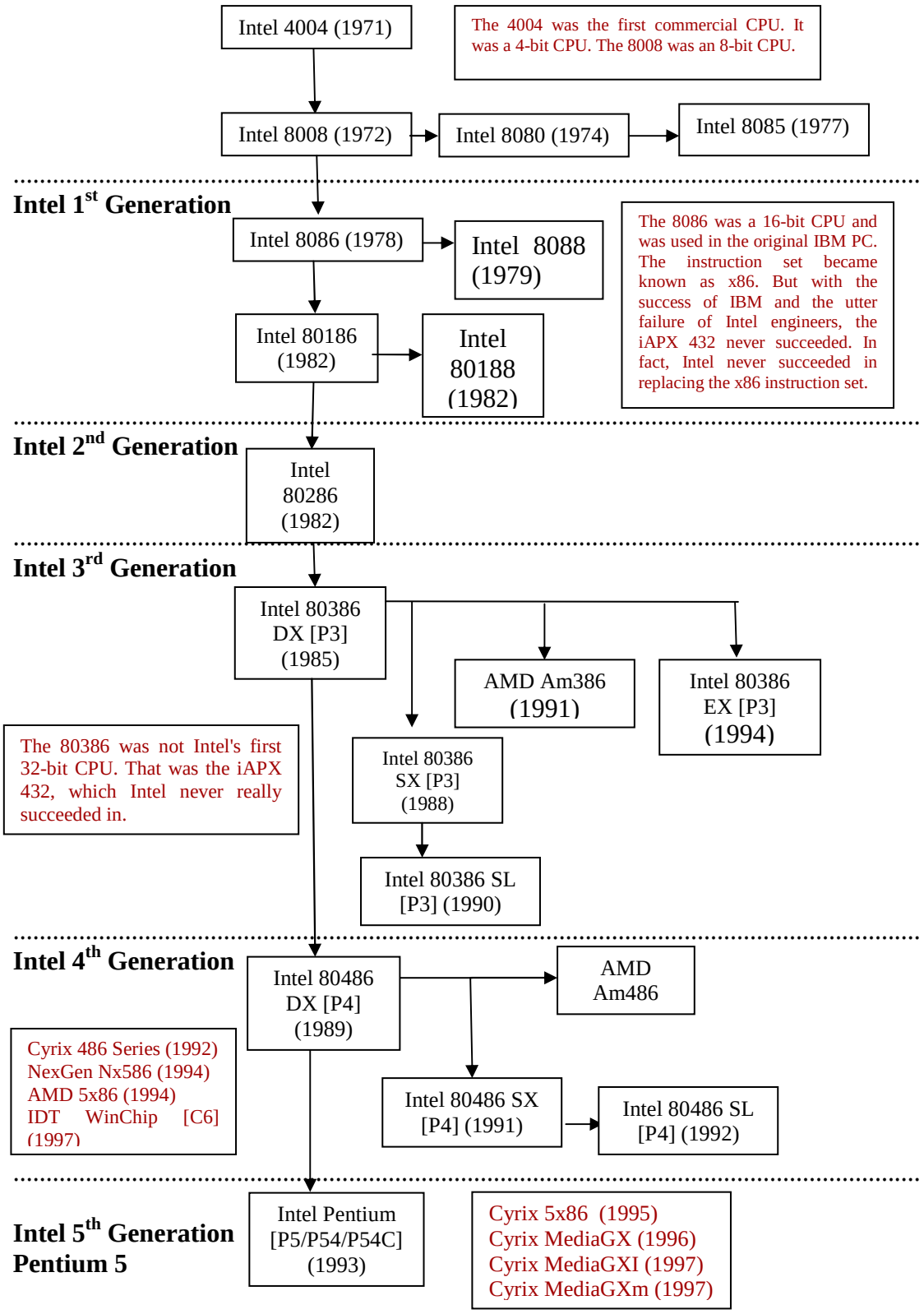

Figure1. Intel Processors from 1st to 5th Generation

1st to 5th GENERATION PROCESSORS

Intel 8086 came into market in 1978. 8086 is a 16-bit device with 10 times the performance of the 8080. In this microprocessor the concept of pipelining and was introduced first time which furthermore increased the execution speed. Segmentation of memory i.e. dividing the memory space in to different segments for example code, data, stack and extra segment was also introduced for the first time. This segmentation of memory enabled the microprocessor to address the memory even though it had no register which could hold 20 bit address. This was done using two registers namely the Base register and Offset register to which a 0H had been hard wired in to the register as the lower nibble of base register and the higher nibble of offset register. Thus when we add both of the register we get a 20-bit address. It had a pre-fetch queue of 6 instructions where in the instructions which were to be executed were fetched during execution of a current instruction. Its architecture is designed to support parallel processing. It is made up of 29,000 MOS transistors and could work at clock rates of 5 to 10 MHz. It has a 16-bit ALU and data bus but the width of address bus is 20-bit.

Intel 8088 In 1979 Intel introduced another microprocessor 8088 which is similar in architecture to 8086 but the difference is in the available number of data bits of the data bus. They were limited to 8-bits even though the ALU is of 16-bits. This is for 8- bit applications requiring higher computational power. It had a pre-fetch queue of 4 instructions.

Intel 80186 By 1982 Intel came up with 80186 and 80286, two products compatible with the 8086 and 8088. The 80186, designed by a team under the leadership of Dave Stamm, integrated onto the CPU a number of functions previously implemented in peripheral chips, producing higher reliability and faster operations speeds at less cost. It had a pre-fetch queue of 6 instructions. It was suitable for high volume applications such as computer workstations, word processor and personal computers. When compared with the previous microprocessors on chip, clock oscillator, interrupt controller, two DMA channels (with all support), chip select logic with operating modes (iRMX186 for master mode and Non iRMX186 for slave mode this is similar to min and max modes in 8086), and three timers. Moreover there were ten extra instructions added to this microprocessor which are, PUSHA and POPA (to push and pop all the registers), IMUL destination, source, SHIFT / ROTATE destination register (this instruction could shift or rotate a register contents given number of times), INS / OUTS (for input and output of a string, ex- INS DS: DI and OUTS DS: SI, other three instructions were required for operating system ENTER, LEAVE and BOUND. It is made up of 134,000 MOS transistor to form 16-bit microprocessors with a 16-bit data bus, 20-bit address bus (could address only 1MB) and could work at clock rates of 4 and 6MHz. This processor is called the first generation of microprocessors.

Intel 80286 The 80286 is first real processor offering multitasking and virtual memory. It is a 16-bit processor capable of addressing up to 16 MB (as it had an address but of 24-bits) of RAM and could also work with virtual memory (1GB). It had a pre-fetch queue of 6 instructions. It introduced the concept of protected mode and real mode. A bit called the mode bit is added to the hardware of the computer to indicate the current mode. With the mode bit, we are able to distinguish between a task that is executed on behalf of the operating system and one that is executed on behalf of the user. The dual mode of operation provides us with the means for protecting the operating system from errant users. The 286 had an extra register called the Machine Status Register (MSW) whose lower nibble (containing D3-D0) defined the mode of operation and moreover it uses a four level memory protection which is an extension of the user/supervisory (protected/real) mode concept. It also had on-chip Memory Management Unit (MMU). This is also the first Intel processor that could run all of the software written for its predecessor. It has 134,000 transistors and could run at 6 to 12.5MHz.

Intel 80386 The 80386, the first popular multitasking 32-bit microprocessor that contained 275,000 transistors, could process five MIPS and could run all popular operating systems. It has a pre-fetch queue length of 16 bytes. It has extensive memory management capabilities. It incorporates a sophisticated technique known as paging, in addition to the segmentation technique, for achieving virtual memory. The 80386 provided a new mode, virtual 8086 mode, in which real-mode programs could run while the processor was in protected mode. To support the concept of virtual memory to a greater extend it also has on-chip address translation unit. This combined with a more flexible segmentation scheme and a larger addressable memory space 4GB and a virtual address space of 64 TB has made 80386 the mode of choice for all modern operating systems. IA-32 adds the extended registers EAX, ECX, EDX, EBX, EBP, ESP, ESI, EDI, EIP, and EFLAGS, as well as two additional, segment registers FS and GS. Originally all registers were special-purpose. The 80386 has automatic self-test feature known as ‘Built-In-Self-Test’ (BIST). The BIST tests approximately one-half of the 80386 which includes the internal control ROM. Cyrix and AMD are out in the marketplace selling their CPUs and math co-processors, calling them 80386, 80387, just like Intel's.

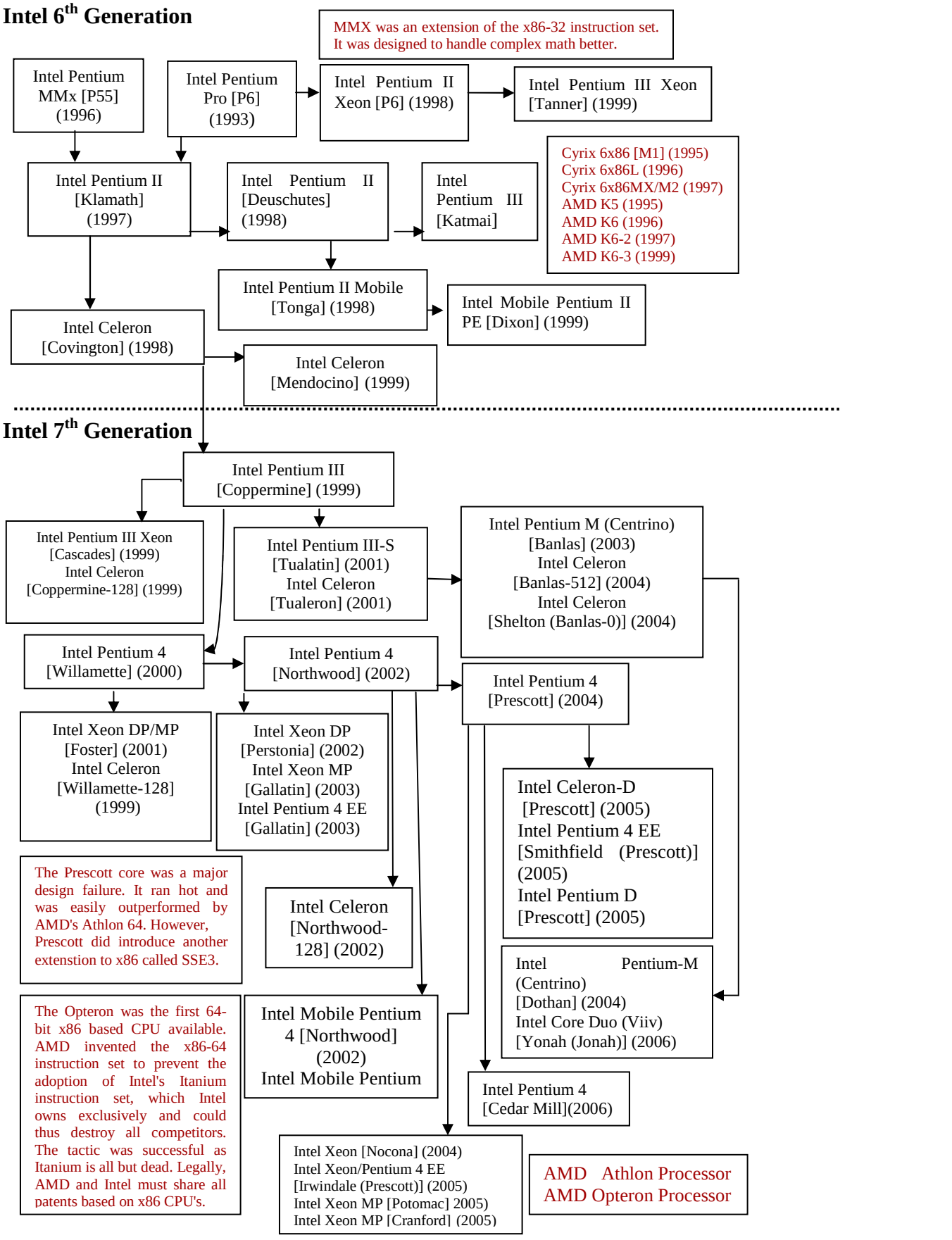

Figure 2. Intel Processors from 6th to 7th Generation

Intel 80486 It included four new features that made the 80486 about twice as fast as the fastest 80386. On average, the math co-processor built into the 80486 yielded three times the greater performance than external 80387 Numeric Processing Unit (NPU). The speed difference between the 80386 and the 80486 made the Graphical User Interface (GUI) practical for everyday use. The address bus in 486 is bi-directional because of the presence of cache memory inside 486 (to enable cache invalidation). It also supports burst type of bus cycle which saves time during floating point operand fetch as well as cache memory fill. Internal data conversion logic unit is available for both 8-bit subsystem and 16-bit subsystems. The on-chip debugging aids of 486 are of three types: Breakpoint instruction, Single-set capability by Trap and Code and data breakpoint capability by means of debug register. The 486 also has a parity generator and parity checker inside it, providing parity logic for Data bus one parity bit for each data byte. This offers better reliability. It consists of 1.2 million transistors and could run at clock rates of 50MHz.

Intel Pentium Intel conducted a contest to come up with a name for the 80586 that isn't a number. Penta means five, and thus the Pentium began as the fifth generation of the Intel x86 architecture. The Pentium had an L2 cache from 256KB to 1MB, used a 50, 60 or 66 MHz system bus and contained from 3.1 to 3.3 million transistors. The revolutionary step in this CPU was twin data pipelines. This enabled the CPU to execute two instructions at the same time. This is known as Super Scalar technology, typically found in RISC based CPUs. The Pentium uses a 32-bit expansion bus. However the data bus is 64-bits which mean the system memory is addressed at 64 bits at a time.

INTEL 6^{TH} TO 7^{TH} GENERATION PROCESSORS

Intel Pentium PRO In 1995 the Pentium Pro was announced. This Pentium introduced a new socket (Socket 8), utilizing 387 pins. The Pro series included ability to run multiple instructions in one cycle, could execute instructions out of order, and had dynamic branch prediction, as well as speculative execution. Also included was an impressive cache arrangement. For programmers, the Pro looks like a classic CISC CPU, while internally the CPU is very RISC oriented in design. This 3.3 Volt CPU (3.1V at 150 MHz) was designed with a 32-bit operating system (OS) such as Windows NT in mind. The Pro chip was the first chip to be offered in the AT or the ATX format. The ATX format was preferred, as the Pro consumed more than 25 W of power, which generated a fair amount of heat. There were several major improvements of Pentium pro over Pentium, for example it had a superscalar architecture, 12-stage super pipeline, internal micro-ops similar to RISC like instructions and internal thermal protection. This microprocessor could be clocked to 200.00 MHz and consisted of 5.5 million transistors.

Intel Pentium II This CPU had remarkable performance. Intel began by separating the processor, and cache of the Pentium Pro, mounting them together on the circuit board with a big heat sink. Then by dropping the whole assembly onto the system board, using a Single Edge Contact (SEC) with 242 pins in the slot, and adding the 57 MMX (Multimedia extension) micro-code instructions, then Intel had the Pentium II [5]. And to further improve cache yields, the Pentium II ran cache at half the speed of the CPU. Pentium II uses the Dynamic Execution Technology, which consists of three different facilities: Multiple Branch Prediction, Dataflow Analysis and Speculative Execution. Multiple Branch Prediction predicts program execution through several branches, accelerating the flow of work to the processor, Dataflow Analysis creates optimized, reordered schedule instructions by analyzing data dependencies between instructions and Speculative Execution carries out instructions speculatively thereby ensures that the multiple execution unit remains busy, boosting overall performance. Pentium II includes data integrity and reliability features such as Error Correction Code (ECC), Fault Analysis, Recovery and Functional Redundancy Checking for both system and L2 cache buses. The pipelined Floating-Point Unit (FPU) supports the 32-bit and 64-bit formats specified in IEEE standard 754, as well as an 80-bit format. Parity protected address/request and response system bus signals with a retry mechanism for high data integrity and reliability. An on-die diode monitors the die temperature. A thermal sensor located on the motherboard can monitor the die temperature of the Pentium II processor for thermal management purposes. This microprocessor could work at clock rates of 300MHz and is made up of 7.5 million transistors.

Intel Pentium III This Processor also uses a Dynamic Execution micro-architecture, a unique combination of multiple branch prediction, data flow analysis, and speculative execution. The Pentium III has two major differences with Pentium II, improved MMX and Processor serial number feature. The improved MMX has totally 70 instructions enabling advanced imaging, 3D streaming audio and video, and speech recognition for enhanced Internet Experience, technology instructions for enhanced media and communication performance. Additionally, Streaming SIMD Extensions for enhanced floating point and 3-D application performance. It also consists of Internet Streaming SIMD Extensions which consisted of 70 instructions and includes single instruction, multiple data for floating-point, additional SIMD integer and cache ability control instructions. Data Pre-fetch Logic anticipates the data needed by the application programs and pre-loads into the Advanced Transfer Cache increasing performance. The processor has multiple low power states such as Sleep, and Deep to conserve power during idle times. The system bus runs at 100MHz and 133MHz allowing for a 33% increase in available bandwidth to the

processor. Applications include membership authentication, data backup/restore protection, removable storage data protection, and managed access to files.

Intel Pentium 4 This was introduced at 1.5GHz in November of 2000. It implements the new Intel Net Burst micro-architecture that features significantly higher clock rates and world-class performance. The Pentium 4 processor is designed to deliver performance across applications. For example, it allows a much better user experience in areas such as Internet audio and streaming video, image processing, video content creation, speech recognition, 3D applications and games, multimedia and multitasking user environments. The Pentium 4 processor enables real time MPEG2 video encoding and near real-time MPEG4 encoding, allowing efficient video editing and video conferencing. It delivers world-class performance on 3D applications and games. It adds 144 new 128-bit SIMD instructions that improve performance for multi-media, content creation, scientific, and engineering applications. Intel Net Burst micro-architecture of the Pentium 4 processor has four main sections: the in-order front end, the out-of-order execution engine, the integer and floating-point execution units, and the memory subsystem. The Pentium 4 processor has a system bus with 3.2G-bytes per second of bandwidth. This high bandwidth is a key enabler for applications that stream data from memory. This bandwidth is achieved with a 64-bit wide bus capable of transferring data at a rate of 400MHz. It uses a source-synchronous protocol that quad-pumps the 100MHz bus to give 400 million data transfers per second. The bus protocol has a 64-byte access length. The Pentium 4 processor has 42 million transistors implemented on Intel's 0.18µ CMOS process, with six levels of aluminium interconnect.

Itanium Intel, with partner Hewlett-Packard, developed a next generation 64-bit processor architecture called IA-64. The first implementation was named Itanium. Itanium core processor is not binary compatible with x86 processors, instead it has a separate compatibility unit in hardware to provide IA32 compatibility. Itanium only allow memory operands in load and store operations. As Itanium was a 64-bit processor, it could address memory up to 4GB of RAM. The processor uses Explicitly Parallel Instruction Computing (EPIC), in which the compiler lines up instructions for parallel execution. Features were added to ensure compatibility with both Intel x86 and HP UNIX applications. The Itanium processor was specifically designed to provide a very high level of parallel processing, to enable high performance without requiring very high clock frequencies (which can lead to excessive power consumption and heat generation). Key strengths of the Itanium architecture include, up to 6 instructions/cycle: The Itanium processor can handle up to 6 simultaneous 64-bit instructions per clock cycle, and the dual-core version can support up to two software threads per core, Extensive execution resources per core: 256 application registers (128 general purpose, 128 floating point) and 64 predicate registers, Large cache: 24MB in the dual-core version (12MB per core), providing data to each core at up to 48GB/s, Large address space: 50-bit physical/64-bit virtual, Small, energy-efficient core: Since Itanium relies on the compiler for scheduling instructions for parallel throughput (other architectures rely on runtime optimization within the processor itself), it has fewer transistors in each core. This may be an advantage in current and future multi-core designs.

Itanium 2 The Itanium 2 is an IA-64 microprocessor developed jointly by Hewlett- Packard (HP) and Intel, and introduced on July 8, 2002. The first Itanium 2 processor (code-named McKinley) was substantially more powerful than the original Itanium processor, roughly doubling performance, and providing competitive performance across a range of data- and compute-intensive workloads. It is theoretically capable of performing roughly 8 times more work per clock cycle than other CISC and RISC architectures due to its Parallel Computing Micro-architecture. However, performance is heavily dependent on software compilers and their ability to generate code which efficiently uses the available execution units of the processor. All Itanium 2 processors to date share a common cache hierarchy. They have 16 KB of Level 1 instruction cache and 16 KB of Level 1 data cache. The L2 cache is unified (both instruction and data) and is 256 KB. The Level 3 cache is also unified and varies in size from 1.5 MB to 24 MB. In an interesting design choice, the L2 cache contains sufficient logic to handle semaphore operations without disturbing the main ALU. The latest Itanium processor, however, features a split L2 cache, adding a dedicated 1MB L2 cache for instructions and thereby effectively growing the original 256 KB L2 cache, which becomes a dedicated data cache. Most systems sold by enterprise server vendors that contain 4 or more processor sockets use proprietary Non-Uniform Memory Access (NUMA**)** architectures that supersede the more limited front side bus of 1 and 2 CPU socket servers. The Itanium 2 bus is occasionally referred to as the Scalability Port, but much more frequently as the McKinley bus. It is a 200 MHz, 128-bit wide, double pumped bus capable of 6.4 GB/s more than three times the bandwidth of the original Itanium bus, known as the Merced bus. In 2004, Intel released processors with a 266 MHz bus, increasing bandwidth to 8.5 GB/s. In early 2005, processors with a 10.6 GB/s, 333 MHz bus were released.

Pentium D The Pentium D is a series of microprocessors that was introduced by Intel at the spring 2005 Intel Developer Forum. A 9xx-series Pentium D package contains two Pentium 4 dies, which place both cores on a single die. The Pentium D was the first announced multi-core CPU from any manufacturer intended for desktop computers. Intel underscored the significance of this introduction by predicting that by the end of 2006 over 70% of its shipping desktop CPUs would be multi-core.

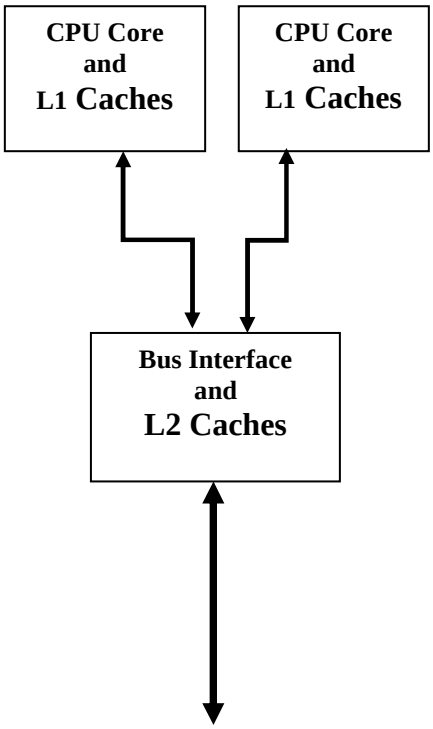

Figure 3. Dual CPU Core Chip

Pentium D 820 runs in at 2.8GHz, is dual-core, it features two 16KB data caches in addition to data cache, each core includes an Execution Trace Cache that stores up to 12 K decoded micro-ops in the order of program execution, Streaming SIMD Extensions 3(SSE3) significantly accelerates performance of digital media applications and includes additional integer and cache ability instructions that may improve other aspects of performance, execute Disable Bit feature combined with a supported operating system, allows memory to be marked as executable and non executable and if code attempts to run in non-executable memory the processor raises an error to the operating system, it also has internal performance counters for performance monitoring and event counting and it also includes a thermal monitor feature that allows motherboards to be more cost effective. Analysts have speculated that the clock rate race between Intel and AMD is largely over, with no more exponential gains in clock rate likely. Instead, as long as Moore's Law holds true, it is expected that the increasing number of transistors that chipmakers can incorporate into their CPUs will be used to increase CPU throughput through other methods, such as adding cores.

Historically, processor manufacturers have responded to the demand for more processing power primarily by delivering faster processor speeds. However, the challenge of managing power and cooling requirements for today's powerful processors has prompted a re-evaluation of this approach to processor design. With heat rising incrementally faster than the rate at which signals move through the processor, known as clock speed, an increase in performance can create an even larger increase in heat. The answer is multi-core microprocessor. For example, by moving from a single high-speed core, which generates a corresponding increase in heat, to multiple slower cores, which produce a corresponding reduction in heat, enterprises can potentially improve application performance while reducing their thermal output. A multi-core microprocessor is one which combines two or more independent processors into a single package, often a single integrated circuit (IC). A dual-core device contains only two independent microprocessor execution units, as shown in the figure 3. In general, multi-core microprocessors allow a computing device to exhibit some form of thread-level parallelism (TLP) without including multiple microprocessors in separate physical packages. This form of TLP is often known as chip-level multiprocessing, or CMP [6].

3. CONCLUSION

Current technology allows for one processor socket to provide access to one logical core. But this approach is expected to change, enabling one processor socket to provide access to two, four, or more processor cores. Future processors will be designed to allow multiple processor cores to be contained inside a single processor module. For example, a tightly coupled set of dual processor cores could be designed to compute independently of each other - allowing applications to interact with the processor cores as two separate processors even though they share a single socket. This design would allow the OS to "thread" the application across the multiple processor cores and could help improve processing efficiency A multi-core structure would also include cache modules. These modules could either be shared or independent. Actual implementations of multi-core processors would vary depending on manufacturer and product development over time. Variations may include shared or independent cache modules, bus implementations, and additional threading capabilities such as Intel Hyper-Threading (HT) Technology. A multi-core arrangement that provides two or more low clock speed cores could be designed to provide excellent performance while minimizing power consumption and delivering lower heat output than configurations that rely on a single high-clock-speed core. Moores' Law had already predicted the trends of future technologies. Based on extrapolation of past trends and on examination of technologies under development, it is predicted that the processing power and memory capacity necessary to match general intellectual performance of the human brain and the required hardware will be available in cheap machines by 2020s.

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NANOFIBRE TRANSMISSION LINE

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ABSTRACT

As our demand for power increases, the burden on our electricity infrastructure grows. This was dramatically demonstrated in the 2003 blackout in the Northeast. Upgrading our infrastructure is a recognized priority. A major challenge is to develop new transmission line materials that are of lighter weight and lower loss than copper. Individual carbon nanotube fibers have an electrical conductivity similar to or better than copper at only one-sixth the weight and with negligible eddy current loss. This high conductivity derives from the highly efficient transmission of electrons down the individual tubes acting as quantum wave guides in one direction, and the efficient resonant quantum tunnelling of the electrons from tube to tube as the current passes down the fiber. Several researchers have demonstrated that one single wall carbon nanotube can carry currents up to 20 microamperes. With an assumed 5% efficiency of conduction from nanotube to nanotube along the length of the fiber and a carbon nanotube packing density of 10^{14} per square centimetre, a carbon nanotube fiber bundle could carry currents of 100 million amperes per square centimetre-100 times the current carrying capacity of the best low temperature superconductors. With current technology, losses in power transmission lines are about 7%. Reducing these losses to 6% would result in a national annual energy savings of 4 X 10^{10} kilowatt-hours-an annual energy savings roughly equivalent to 24 million barrels of oil. Current production of single-wall nanotube typically results in fibers that are less than 100 micrometers in length and have widely varying electrical conduction properties. So, there are many technical challenges to overcome: How can we consistently produce nanotube with controlled conduction properties? How can CNTs be cost-effectively manufactured into ropes and fibers with desired electronic properties? How can the transmission at tube-to-tube junctions be increased to almost 100 percent?

Keywords: CNTs, SWNTs, QWs, ACSR, ACCR, armchair QW, HTS

1. INTRODUCTION

1.1 Nanotubes can be thought of as a sheet of carbon atoms bonded together in hexagon patterns and rolled up into cylinders. They can be single-walled tubes - that is, a single layer of atoms - or multiwalled tubes composed of cylinders within cylinders. Single-walled tubes are more desirable. Each nanotube is about 50,000 times smaller in diameter than a human hair. They're about the diameter of your DNA. Strong bonds between the carbon atoms make carbon nanotube many times stronger than steel. If they can be manufactured properly, they should be the strongest material ever available to us. When nanotube are created, they come in three types, depending on the angle at which the lattice of carbon atoms lines up along the tube. Only one type, called metallic nanotube, is a good conductor of electricity. The other two types are semiconductors and do not conduct electricity well. Producing only the metallic nanotube has proved "fiendishly difficult,”.

1.2 Researchers have developed ways to weed out the nonconducting nanotube, but not efficiently enough for mass production purposes. A second problem is producing "crystalline fiber”. Those are long, highly ordered, single-wall nanotube. They are the most perfect, hence the strongest and most conductive nanotube. What can be produced today is mostly a mixture of high-quality and mediocre single-wall and multiwall nanotube. Researchers are still working to produce uniform batches of "quality molecules,” Instead of producing one-third conductors and two-thirds semiconductors, "we have almost a 50-50 mix,”

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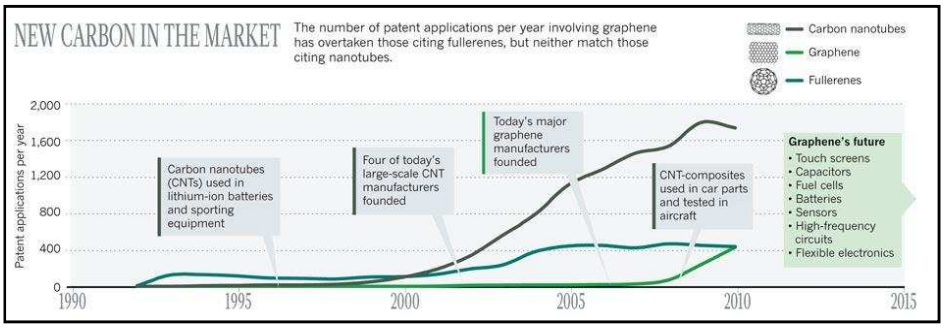


Graph 1: Development stages of CNTs

The above graph shows the development stages of CNTs. Nanocomp has succeeded at producing nanotubes "distinguished by their long length - up to one millimeter,". Only a few other nanotube makers have managed that. In theory, it should be possible to make nanotube of unlimited length.

2. BULK MANUFACTURING

2.1 There are more than 50 types of transmission lines in use, with even more in the R&D stage. The goals are reductions in line loss and line faults and greater overall grid reliability and efficiency. An increasing number of transmission line applications incorporate high-temperature superconducting technologies. New types of composite conductors are being developed to retain their strength and be more resistant to degradation at high temperatures. What's more, this sector is seeing some exciting new wide-area management systems (WAMS) and other applications built on top of data from synchrophasors. Some are even proposing an "air traffic control system" for the national grid. produced commercially useful lengths of nanotube wire and "massive amounts" of nanotube cloth. Examples of nanoparticles with the potential to impact energy transmission system development include the following:

- A carbon nanotube (CNT) is a type of fullerene (carbon-only) molecule that is formed when atoms of carbon link together into tubular shapes. CNTs are generally extremely light, strong, and resilient, and some CNTs can be many times more electrically conductive than steel or copper. CNTs are available for industrial applications in bulk quantities, but they currently can cost as much as $200,000 per pound
- Carbon atoms may also link to form spherical nanostructures that can be coated or filled with atoms; these "buckyball" fullerenes are used in mechanical and semiconductor operations.
- Nanodots, or quantum dots, are nanoscale semiconductor crystals having electrical and optical properties that may make for more efficient lighting and solar collection.

2.2 A specific type of CNT, the "armchair" CNT, has the potential to greatly impact electrical conductivity and transmission. The armchair CNT is 30 to 100 times stronger than steel, conducts heat better than diamond, and conducts electricity better than any other molecule discovered to date. Some researchers liken CNTs to a new miracle polymer. Electrons move down this tube as a coherent quantum particle, much like a photon of light travels down a single-mode optic fiber. Individual armchair tubes can conduct as much as 20 microamps of current. This doesn't sound like much until you realize that this little molecular wire is only 1 nanometer in diameter. A half-inch-thick cable made of these tubes aligned parallel to each other along the cable would have over 100 trillion conductors packed side-by-side like pipes in a hardware store. If each of these tubes carried only one microamp, only 2% of its capacity, the half-inch-thick cable would be carrying one hundred million amps of current. Fabricating such a cable — we call it the "armchair quantum wire". The black, paper like sheets are as strong as stainless steel, but many times less dense, the company said. The material might be used for shielding electronics from interference and for making ultra-strong composites for building aircraft, ships and vehicles that are lighter yet stronger than those being built today. As for the company's nanotube wire, in Air Force tests so far, it has not proved to be more conductive than copper, Bulmer said. "In theory, it should be real conductive. In real life, we have a ways to go." Nanocomp says its own tests show that at high electrical frequencies, its nanotube wire has been more conductive than copper.

2.3 If conductivity can be increased by factors of five to 10, the lightweight wire will be very attractive for uses as varied as wiring in aircraft to building lightweight motors. Highly conductive nanotube wire would, indeed, be valuable across the military. The Navy would want it for its all-electric ships and the Army could use it in rail guns and microwave weapons. Nanotube wire promises new types of lightweight generators, better batteries, more efficient photo-electric technology and electric transmission lines that lose far less power. "No other material has the theoretical potential" of carbon nanotubes.

3. NANO TECHNOLOGY: ENERGY TRANSMISSION TECHNOLOGIES

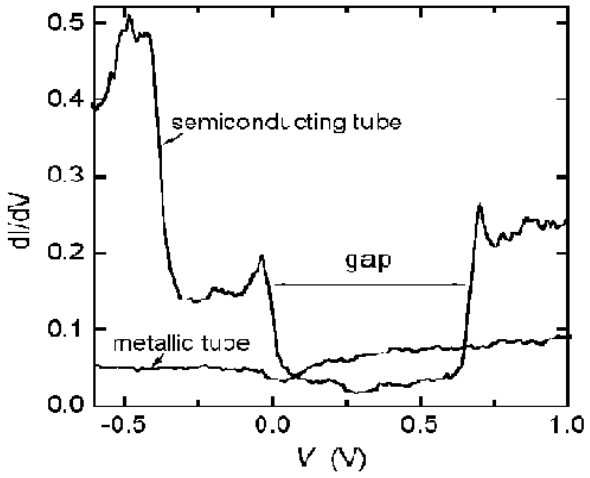
3.1 Nanotechnology may help improve the efficiency of electricity transmission wires. Today, aluminum conductor steel reinforced (ACSR) wire is the standard overhead conductor against which alternatives are compared. The development of new overhead conductors is expected to increase the capacity of existing ROWs by five times that of ACSR wire at current costs. A nanomaterial-based metal-matrix overhead conductor known as the aluminum conductor composite reinforced (ACCR) wire, which is designed to resist heat sag and provide more than twice the transmission capacity of conventional conductors of similar size. This ACCR wire is currently in use, or has been selected for use, by six major utilities across the country. "Aluminum has been a key ingredient in bare overhead conductors for decades. The difference is that ACCR wire is based on the use of aluminum processed in new ways to create high-performance and reliable overhead conductors that retain strength at high temperatures and are not adversely affected by environmental conditions." The ACCR wire's strength and durability derive from its nanocrystalline aluminum oxide fibers, which are embedded in the high-purity. Replacing current wires with nanoscale transmission wires, called quantum wires (QWs) or armchair. QWs, could revolutionize the electrical grid.

3.2 The electrical conductivity of QW is higher than that of copper at one-sixth the weight, and QW is twice as strong as steel. A grid made up of such transmission wires would have no line losses or resistance, because the electrons would be forced lengthwise through the tube and could not escape out at other angles. Grid properties would be resistant to temperature changes and would have minimal or no sag. (Reduced sag would allow towers to be placed farther apart, reducing footprint and attendant construction and maintenance impacts.) QW, if spun into noncorrosive polypropylene-like rope, could conceivably be buried "forever" with no fear of corrosion and. Such a grid could have a million times greater capacity than what exists today (assuming the 1-centimeter-diameter aluminum cable carrying about 1,000 to 2,000 amps); even if the capacity were increased by only 0.1%, the amount of enhanced capacity would still be impressive. The realization of such conducting possibilities depends on developing processes for producing high-quality CNTs in industrial quantities and at reasonable cost, finding ways to manipulate and orient nanotubes into regular arrays, and developing robust testing methods. Today, QWs made from metallic CNTs are very short no longer than several centimeters and are manufactured only in limited quantities. When nanotubes are synthesized, a variety of different configurations appear. The armchair CNT is the only type that conducts electricity well enough for QWs. Currently, only 2% of all nanotubes can be used as QWs, and sorting the armchair nanotubes from the rest is nearly impossible. Current processing technologies are not capable of producing nanotubes with controlled and desirable production properties consistently.

3.3 Long-distance transmission of electrical current entails significant losses (about 20%) due to electrical resistance. Superconductors transmit electricity with a small fraction of the losses from conventional conductors, thereby enabling power transmission at higher power densities. Such efficiencies may relieve transmission congestion and lessen the need for transmission equipment. High-temperature superconductors (i.e., substances that become superconducting near liquid nitrogen temperatures [about 77 Kelvin (K)] rather than near liquid helium temperatures [about 4 K]) were discovered in the late 1980s. Noting that transmission constraints have contributed to higher electricity prices and reduced reliability, the 2001 National Energy Policy Report (National Energy Policy Development Group 2001) recommended expanded research and development on transmission reliability and superconductivity. HTS cables have been demonstrated at full scale at distribution voltages and in lengths up to 100 m. Large-scale use of second-generation HTS wire carrying high-amperage electrical current with virtually no resistance promises dramatic gains in energy efficiency. Other advantages of HTS cables include:

- HTS cables can carry more power at the same voltage than conventional cables, meaning that the need for 500-kilovolt (kV) and higher voltage transmission, which requires expensive power equipment, could be eliminated.
- Because HTS cables are operated at cryogenic temperatures, they have a lower susceptibility to temperature-related faults than overhead lines.
- HTS cables would be sited underground, making them less vulnerable than overhead transmission lines to natural events and unintentional or intentional disruptions.

3.4 HTS also has disadvantages. For one, the cost of the HTS wire is currently much higher than that of conventional conductors (such as copper or aluminum) used for electricity transmission and distribution. Also, HTS wires are more susceptible to magnetic fields than their metallic counterparts. If exposed to large magnetic fields such as those found in transmission lines, they would develop resistance, which would heat the ceramic and result in decreased efficiency.



Graph 2: Comparison between metallic tubes and CNTs

4. OTHER ELECTRICAL TRANSMISSION INFRASTRUCTURE

4.1 Nanotechnology applications may help improve other components of the electric transmission infrastructure, thereby potentially reducing environmental impacts. The examples below pertain to transformers, substations, and sensors.

4.2 Transformers

Fluids containing nanomaterials could provide more efficient coolants in transformers, possibly reducing the footprints, or even the number, of transformers. Nanoparticles increase heat transfer, and solid nanoparticles conduct heat better than liquid. Nanoparticles stay suspended in liquids longer than larger particles, and they have a much greater surface area, which is where heat transfer takes place. Using nanoparticles in the development of HTS transformers could result in compact units with no flammable liquids, which could help increase siting flexibility.

4.3 Substations

Substation batteries are important for load-leveling peak shaving, providing uninterruptible supplies of electricity to power substation switchgear, and for starting backup power systems. Smaller, more efficient batteries could reduce the footprints of substations and possibly the number of substations within a ROW.

4.4 Sensors

Nanoelectronics have the potential to revolutionize sensors and power-control devices. Nanotechnology-enabled sensors would be self-calibrating and self-diagnosing. They could place trouble calls to technicians whenever problems were predicted or encountered. Such sensors could also allow for the remote monitoring of infrastructure on a real-time basis. Miniature sensors deployed throughout an entire transmission network could provide access to data and information previously unavailable. The real-time energized status of distribution feeders would speed outage restoration, and phase balancing and line loss would be easier to manage, helping to improve the overall operation of the distribution feeder network.

5. CONCLUSION

This paper provides the alternative method for the transmission line as a nanotube material. Facilitating the Nanotube wires is part of this change in the transmitting electrical signal and will be a fruitful long term objective of Power Electronics. We are more than eager to follow such research activities in the years to come. The implementation of this technique is the point of research by considering the various constrains, but the primary implementation may be the solution to the future transmission line.

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WIRELESS COMMUNICATIONS: PAST, PRESENT AND FUTURE

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ABSTRACT

Nobody in this world knows exactly when the history of wireless communications started. Several people, such as Maxwell, Hertz, Hughes, and Branly to name a few, established the principle of electromagnetism, which quickly became the basic foundations of the wireless telecommunications. Marconi was later claimed as the father of wireless communications after his invention, a radio, has changed the way people communicate drastically. Nowadays, more than sixty per cent of humans' communications is done wirelessly and a lot more effectively. Wireless communications are expected to be the dominant mode of access technology in the future. Besides voice, a new data range of services such as multimedia and high speed data are being offered for delivery over wireless network. Mobility will be seamless, realizing the concept of persons' being in contact anywhere, at any time. Throughout this paper, we review the long, interesting development of wireless communication in the past, examine the current progress in standards and technologies, and finally discuss possible trends for wireless communication solutions.

Keywords: Maxwell, Differential Equation. GSM, Bluetooth, wireless internet, Wireless Application Protocols (WAP), Asynchronous transfer mode (ATM)

1. INTRODUCTION

1.1 Understanding the history is as important as understanding the methodical concept behind technology. History has made people realizing the complexity of one device as well at the same time made people to be aware of where the world will shift in the future. History has proven that wireless communication have already changed the way people communicate with each other. While the progress has been impressive, much more is yet to come that will revolutionize communications as we know it, leading eventually to communicating with anyone or any device at any time.

1.2 The demands of the next-century customer are difficult to anticipate. It is clear, however, that in the next years to come, people will communicate with more means than just voice. There is a desire to communicate simultaneously using speech, viewing, and data. The speed of the communication will also be important. This paper will outline in great details how wireless communications have advanced in the past two centuries. History has proven that wireless communication have already changed the way people communicate with each other. From the history, one can learn that the development of this technology has been collective efforts from many individuals.

2. BEFORE THE "BIRTH OF RADIO"

2.1 Maxwell's Differential Equation

Maxwell's first major contribution to science was a study of the planet Saturn's rings, the nature of which was much debated. Maxwell's most important achievement was his extension and mathematical formulation of Michael Faraday's theories of electricity and magnetic lines of force. When he first became interested, he wrote Kelvin asking how best to proceed. Kelvin recommended that Maxwell read the published works in the order Faraday, Kelvin, Ampère and then the German physicists. Maxwell wanted to present electricity in its most simple form. He started out by writing a paper entitled "On Faraday's Lines of Force" (1856), in which he translated Faraday's theories into mathematical form, presenting the lines of force as imaginary tubes containing an incompressible fluid.

He then published "On Physical Lines of Force" (1861) in which he treated the lines of force as real entities, based on the movement of iron filings inn a magnetic field and using the analogy of an idle wheel. He also presented a derivation that light consists of iron transverse undulations of the same medium in which is the cause of electric and magnetic phenomena. In his research, conducted between 1864 and 1873, Maxwell showed that a few relatively simple mathematical equations could express the behavior of electric and magnetic fields and their interrelated nature; that is, an oscillating electric charge produces an electromagnetic field.

His four differential equations can be summarized as the following:

1. Electric fields come from a single charge (it has definite starting and ending point at the charge itself or at infinity).

2. Neither a starting nor an ending point for a magnetic field can be located.

3. If a magnetic field is altered, then over time it will become an electric field; however, no beginning or ending points can be located since the field was not created by charges.

4. Changing an electric field will convert it into a magnetic field over time, and it will retain its looping properties.

These four partial differential equations first appeared in fully developed form in *Electricity and Magnetism* (1873). Since known as *Maxwell's equations* they are one of the great achievements of 19th-century physics. Maxwell also calculated that the speed of propagation of an electromagnetic field is approximately that of the speed of light. He proposed that the phenomenon of light is therefore an electromagnetic phenomenon. Because charges can oscillate with any frequency, Maxwell concluded that visible light forms only a small part of the entire spectrum of possible electromagnetic radiation. Maxwell used the later-abandoned concept of the ether to explain that electromagnetic radiation did not involve action at a distance. He proposed that electromagnetic-radiation waves were carried by the ether and that magnetic lines of force were disturbances of the ether.

Even though these four equations were not directly intended for the theory of relativity, they have made a significant contribution in the development of the theories of relativity by later mathematicians and physicists. For example, Hendrik Lorentz used a slightly modified version of Maxwell's equations in order to develop the concept of length contraction when an object is traveling near the speed of light.

After Maxwell’s phenomenal theorem in 1867, the progress of the wireless communication history was slowing down. In spite of that, the year 1869 saw the first successful Trans-Atlantic telegraph cable. Two years later, an empire cable was built which linked to Australia. In 1879, the first telephone exchange was opened in London.

2.2 Hertz’s ideas on the electromagnetic waves

Heinrich Rudolf Hertz (1847-1894) was the first to broadcast and receive radio waves. Hertz clarified and expanded the electromagnetic theory of light that had been put forth by Maxwell in 1884. Maxwell's theory had been based on unusual mechanical ideas about the ether and had not been universally accepted. Hertz proved that electricity can be transmitted in electromagnetic waves, which travel at the speed of light and which possess many other properties of light. Between 1885 and 1889, he produced electromagnetic waves in the laboratory and measured their wavelength and velocity. His experiments with these electromagnetic waves led to the development of the wireless telegraph and the radio.

Even at a theoretical level, Hertz's accomplishments were quickly seen by others as the beginning of a new "electric age." The English mathematical physicist, Sir Oliver Heaviside, said in 1891, "Three years ago, electromagnetic waves were nowhere. Shortly afterward, they were everywhere."
Summing up Hertz's importance: his experiments dealing with the reflection, refraction, polarization, interference and velocity of electric waves would trigger the invention, soon after, of the wireless telegraph and of radio.

3. THE “BIRTH OF RADIO”

3.1 Marconi and the Wireless Telegraph

With total justification Guglielmo Marconi is called the pioneer of wireless, freeing communications from the constraints imposed by fixed cable and visible distance. Conquering distance, he facilitated commercial and mass communication, bringing all parts of the world closer together. In an era when all intercontinental transport was entirely marine, Marconi's achievements in wireless meant that ships at sea were no longer isolated and beyond reach of communication once they left sight of land. Marconi personally was regarded as a great benefactor and was accorded recognition and decorations wherever he went.

3.2 Patents and Radio Station

By the end of 1896, Marconi had demonstrated his system to the GPO and to the armed services. He had also given a public demonstration with Preece at the Toynbee Hall in London. This caused a sensation and Marconi became a celebrity.

For Professor Lodge, the growing fame of Marconi as the 'inventor of wireless', was deeply hurtful, particularly so when Marconi was granted his British patent (No.12039) in March 1897. According to one journal, what Marconi had publicly

described were the products of Lodge's brain, not his own. But the writer had missed the point: Professor Lodge had lacked the vision to see the potential application of wireless; Marconi, however, had quickly understood and sought to exploit it.
In July 1897, the *Wireless Telegraph & Signal Company* was registered in the United Kingdom (UK).

The Wireless Telegraph and Signal Company changed names several times to:

- 1900: Marconi's Wireless Telegraph Company
- 1963: Marconi Company Limited
- 1987: GEC- Marconi Limited
- 1998: Marconi Electronic Systems Limited
- 1999: Marconi plc.

4. TRANSOCEANIC COMMUNICATION

4.1 Transmitting Radio Signal Across the Ocean

Marconi's first aim in perfecting communication without wires had been to break the isolation of the sea. The first life-saving possibilities of wireless were realized in 1899 when a wireless message was received from the East Goodwin lightship – which had been equipped with Marconi wireless apparatus. It had been rammed in dense fog by a steamship *R.F. Matthews.* A request was made for the assistance of a lifeboat.

By the end of April 1900, the company had changed its name to Marconi's Wireless Telegraph Company and been granted its famous 'Four Sevens' patent, covering a syntonic tuning device that solved the problem of mutual interference (jamming) of wireless signals. To exploit the opportunities now opening in shipping, a subsidiary, The Marconi International Marine Communication Company, was formed to undertake all maritime work.

4.2 Bidirectional Communication

In February 1902, however, Marconi sailed once more for the USA on board the SS Philadelphia, which had been fitted with aerials attached to the ship's masts. As the ship steamed westwards signals were sent from Poldhu and came through clearly on the Morse tape inker. The captain attested that readable messages were received up to 1,551 miles at sea. Reception of the Morse code for the letter 'S' was maintained on the filings coherer up to 2,099 miles. All this was achieved using aerial masts of 150 feet, as against the kite - supported aerial at St John's of 500 feet.

At last skeptics were silenced. By the end of 1902 Marconi had established a permanent station at Glace Bay in Nova Scotia, Canada, as well as at Cape Cod in the USA. Messages were sent in December from the Governor General of Canada and Marconi to King Edward VII, also from Marconi to the King of Italy. In January 1903, the first wireless message to be transmitted directly from the USA to England was sent from the President to King Edward VII.

By 1903, the Company had built a number of stations on shore and many merchant ships had been fitted with its wireless sets, which had to be rented from the company and were operated by Marconi personnel, who were allowed to communicate with operators using apparatus from rival companies during emergencies only.
Throughout the 1920s, major countries including the U.S., France and Great Britain developed networks of high-powered radio stations. The American Telegraph and Telephone Company became much more active, as did Marconi's Wireless Telegraph Company of Canada.

At this stage in its development, the true potential of radio telephony – the transmission of words and music – was slowly becoming clear, and an entire industry evolved based on the recreational value of radio. Wireless technology factories, abandoned after the war, were re-opened to begin mass production of radio receivers for the general population.

Radio sets became common on aircraft, ships and tanks. Radio telephony was also adapted for use in crime detection by police forces in Britain and the States.

5. CELLULAR MOBILE TELEPHONY

5.1 Lars-Magnus Ericsson: Early days

Lars Magnus Ericsson was one the most influential persons behind the early years of telephone manufacturing. Lars Magnus Ericsson opened his electro-mechanical workshop in rented premises in Stockholm in 1876. Ericsson contributed substantially to the design of early telephone exchanges, designing and producing the first 'multiple desk' in Europe in 1884. Many of these switchboards were used for more than half a century. In the concluding years of his business life, Ericsson participated actively in the design and engineering of the then new central battery system. However, he still insisted on

continuing product excellence and his standards were higher than those then considered necessary for foreign competitors. The solid quality of Ericsson's work and the elegance of his designs established his products as symbols of the finest available.

5.2 Commercial American Radio-Telephone Service

On June 17, 1946 in Saint Louis, Missouri, AT&T and Southwestern Bell introduced the first American commercial mobile radio-telephone service to private customers. Mobiles used newly issued vehicle radio-telephone licenses granted to Southwestern Bell by the FCC. They operated on six channels in the 150 MHz band with 60 kHz channel spacing. Bad cross channel interference, something like cross talk in a landline phone, soon forced Bell to use only three channels. In a rare exception to Bell System practice, subscribers could buy their own radio sets and not AT&T's equipment.

The Radio Phone Service had a central transmitter serving mobiles over a wide area. One antenna served a wide area, like a taxi dispatch service. While small cities used this arrangement, radio telephone service was more complicated, using more receiving antennas as depicted below. That was because car mounted transmitters weren't as powerful as the central antenna, thus their signals couldn't always get back to the originating site. In other words, a receiving antenna was needed throughout a large area to funnel radio traffic back to switch handling the call. This process of keeping call going from one zone to another was called *handoff*.

5.3 The First Commercial Cellular Radio System

In January, 1969 the Bell System made commercial cellular radio operational by employing frequency reuse for the first time. Six channels in the 450 MHz band were used again and again in nine zones along the 225 mile route. A computerized control center in Philadelphia managed the system

In 1971 Intel introduced the first microprocessor, the 4004. Designed originally for a desktop calculator, the microprocessor was soon improved on and quickly put into all fields of electronics, including cell phones. The original did 4,000 operations a second. According to the June, 2001 issue of Wired magazine, Gordon Moore described the microprocessor as "one of the most revolutionary products in the history of mankind." On October 17, 1973, Dr. Martin Cooper for Motorola filed a patent entitled 'Radio telephone system.' It outlined Motorola's first ideas for cellular radio and was given US Patent Number 3,906,166 when it was granted on September 16, 1975.

On May 1, 1974 the F.C.C. decides to open an additional 115 megahertz of spectrum, 2300 channel's worth, for future cellular telephone use. Cellular looms ahead, although no one know when FCC approval will permit its commercial rollout. American business radio and radio-telephone manufacturers begin planning for the future.

5.4 The Development of GSM

Europeans saw things differently. No new telephone system could accommodate their existing services on so many frequencies. They decided instead to start a new technology in a new radio band. Cellular structured but fully digital, the new service would incorporate the best thinking of the time. They patterned their new wireless standard after landline requirements for ISDN, hoping to make a wireless counterpart to it. The new service was called GSM.

GSM first stood for *Groupe Speciale Mobile*, after the study group that created the standard. It's now known as Global System for Mobile Communications, although the "C" isn't included in the abbreviation. GSM development began in 1982 by a group of 26 European national phone companies. This Conference of European Postal and Telecommunications Administrations (CEPT), sought to build a uniform, European wide cellular system around 900 MHz. A rare triumph of European unity, GSM achievements became "one of the most convincing demonstrations of what co-operation throughout European industry can achieve on the global market." Planning began in earnest and continued for several years.

In the mid-1980s commercial mobile telephony took to the air. The North American terrestrial system (NATS) was introduced by Airfone in 1984, the company soon bought out by GTE. The aeronautical public correspondence or APC service breaks down into two divisions. The first is the ground or terrestrial based system (TAPC). That's where aircraft placed telephone calls go directly to a ground station. The satellite-based division, which came much later, places calls to a satellite which then relays the transmission to a ground station. AT&T soon established their own TAPC network after GTE.

5.5 The Future of Cellular Phone

Today’s cellular products are still mainly based on analog frequency modulation for speech transmission and there are several incompatible standards employed in different parts of the world. The future of cellular technology is based on the digital technology and the concept of microcells.

A microcell is an area served by a radio base station; however, it will be one or two orders of magnitude smaller than the current cellular system. The base station of microcells will also be much smaller and cheaper and can be mounted on lamp

posts or utility poles. The coverage area of a microcell can be 150 meters or less. By virtue of the smaller cells, microcells can be considerably increase the area of coverage and reuse bandwidth, reduce the energy consumption, and size of communication device. The United State government has set aside certain bandwidths for the use of microcells for personal communications services (PCS). The Federal Communication Commission (FCC) has been auctioning 30 MHz PCS licenses in 51 markets

6. CONCLUSION

In this paper, the development of some major wireless communication devices have been outlined. It is noted that the advancement of this technology has been a cumulative efforts from many individuals, rather than work of sole individual. History has proven that wireless communication have already changed the way people communicate with each other. While the progress has been impressive, much more is yet to come that will revolutionize communications as we know it, leading eventually to communicating with anyone or any device at any time.

The demands of the next-century customer are difficult to anticipate. It is clear, however, that in the next years to come, people will communicate with more means than just voice. There is a desire to communicate simultaneously using speech, viewing, and data. The speed of the communication will also be important.

In summary, wireless technologies are capable of meeting the challenge to provide a wide range of new services and therefore have the potential to be the dominant mode of access in the future.

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TEMPERATURE DISTRIBUTION CURVES FOR THE SPECIFIC ANTENNA PARAMETERS USING PENNES' BIOHEAT TRANSFER EQUATION

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ABSTRACT

Thermal models are used to predict temperature distributions of heated tissues during thermal therapies. Recent interest in short duration high temperature therapeutic procedures necessitates the accurate modeling of transient temperature profiles in heated tissues. This paper describes an optimization process specially designed for regional hyperthermia of deep seated tumors in order to achieve desired steady-state temperature distributions. Optimal heating is obtained by minimizing an integral object function which measures the distance between desired and model predicted temperatures.

Keywords*:* Thermal profile of Biomass, Specific Absorption Rate (SAR), Microwave Ablation (MWA)

1. INTRODUCTION

Hyperthermia is a promising treatment modality for various types of cancer. The technique involves heating the tumour with electromagnetic fields, generally using antenna arrays to focus the energy. In planning the therapy, the therapeutically optimal antenna parameters for the applicator are determined for each patient and the temperature distribution is predicted by solving the Pennes' bio-heat transfer equation. Since it is the temperature increase in hyperthermia cancer therapy that causes the increased cell death in tumours, it is of the utmost importance to determine the temperature distribution correctly and with high resolution. For this, the Pennes' bio-heat equation with temperature and time-dependent tissue parameters for the blood vessels can be solved interactively [1]. To start the optimization process a specially designed object function is defined. The aim is to get a temperature distribution which nearly avoids "hot spots" in healthy tissue and "cold spots" in the tumor region. In order to derive a fast optimization the nonlinear model by a sequence of linear ones can be optimized by applying a superposition principle. Adaptive finite elements methods in space and linearly implicit integrators in time with step size control are used to solve the nonlinear bio-heat-transfer equation .The control of human body temperature is a complex mechanism involving hormones, blood flow to the skin, respiration, and metabolic rate. Consequently, temperature is an important parameter in the diagnosis and treatment for many diseases. Elevated local temperature can be an indication of excess or abnormal metabolic rates. Inflammation is the body's mechanism for removing foreign or diseased substances. Exercise also induces an increase in local temperature of skeletal muscles and joints. Most previous studies of MWA were mainly focused on SAR and did not consider heat transfer caused an incomplete analysis of the results. While clinical treatment with MWA needs to control the tissue temperature and the lesion generation accurately, in order to ensure cancer cells destruction and to minimize side effects to surrounding tissue and surrounding organs.

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2. TEMPERATURE SENSORS

Some diagnostic procedures involve the measurement of temperature. Temperature-measuring devices can fall into two categories, invasive and noninvasive. Invasive temperature sensors offer the advantages of small size, fast response time, extreme sensitivity to temperature changes and high stability. However, they have generally involved a limited number of measurement locations, uncertainties about the anatomic placement of thermometry devices, interaction with the energy applied, periodic rather than continuous temperature measurements, and in some cases, surgical exposure of the target tissue for placement of the temperature probes [2]. Invasive temperature devices include thermocouples, thermistor beads, optical fiber sensors, etc. A thermocouple consists of two pieces of dissimilar metal that form two junctions. In the wire, an electric potential difference is formed if there exists a temperature difference between the two junctions. This potential difference can be measured with a voltmeter and translated to temperature with a fairly simple means of calibration. A thermocouple usually has a good long-term stability, responds very quickly to changes in temperature, and can be constructed in a manner that allows a good resolution. Another kind of invasive device, the thermistor bead, is made by depositing a small quantity of semiconductor paste onto closely spaced metal wires. The wire and beads is inserting at a high temperature when the material forms a tight bond. The wires are then coated with glass or epoxy for protection and stabilization. The resistors generally exhibit high thermal sensitivity. This characteristic sensitivity to temperature change can result in a thermistor resistance change of more than 50°C. Unlike a thermocouple or thermistor bead, the fiber optic temperature probe does not interfere with an electromagnetic field. It has been used to measure tissue temperature rise induced by microwave and/or radio-frequency heating [Zhu et al., 1996b; 1998]. However, it is relatively big in size (~1.5 mm diameter) and has a lower temperature resolution (~0.2°C).[3]

3. BASIC TISSUE TEMPERATURE MEASUREMENT

Luxtron Fluoroptic thermometer model 3100 is used to measure tissue temperature during ex-vivo bovine liver tissue MWA. A luoroptic thermometer was selected because its fiber-optic temperature sensors are unaffected by microwave radiation and have minimal disturbance on the antenna SAR.

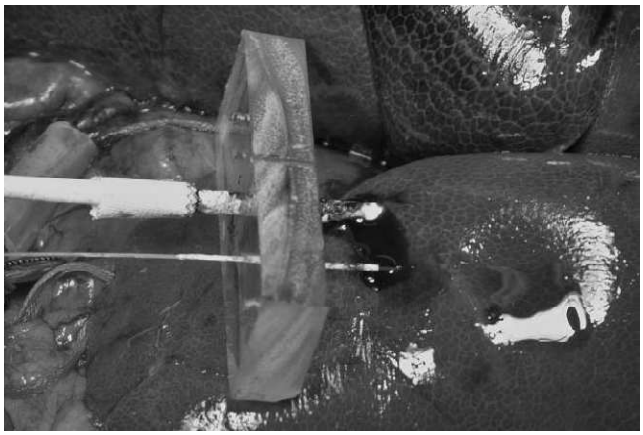

Fig1. In-vivo temperature measurement

The fiber-optic sensors are inserted into the liver alongside the antenna probe. Fig1 shows a photo of in-vivo temperature measurement. A glass template was used to guide the antenna and the fiber optic sensor and ensure their relative positions.

4. HEAT TRANSFER ANALYSIS

The basic model used in our simulation is the in stationary bio-heat-transfer equation proposed by Pennes:

$$\rho c \frac{\partial T}{\partial t} = \operatorname{div}(\kappa \operatorname{grad} T) - c_b W (T - T_b) + Q_e \qquad \text{---Eq.(1)}$$

Where, the left hand side denotes the transient term. The first, second and third terms on the right hand side of Eq. (1) denote heat conduction, heat dissipation by the blood flow, and external heat source (heat generation by the electric field), respectively. Here ρ is the density of tissue, c is specific heat of tissue and blood, *K* is the thermal conductivity of tissue; T is

the blood temperature; *W* is the mass flow rate of blood per unit volume of tissue. The power Q_e deposited by an electric field *E* in a tissue with electric conductivity is given by

$$Q_e = \frac{1}{2}\sigma |E|^2 \quad \text{--Eq. (2)}$$

One could consider that the PTFE catheter is a thermal insulator and the heat transfer analysis is limited to the liver tissue domain; therefore, thermal properties are only needed for liver tissue and blood [4]. When microwave propagates in liver tissue, microwave energy is absorbed by liver tissue and converted into internal heat generation which causes the tissue temperature to rise. The SAR represents the electromagnetic power deposited per unit mass in tissue (W/kg) and is defined by:

$$SAR = \frac{\sigma_{liver}}{2\rho}\left|\vec{E}\right|^2. \quad \text{--Eq. (3)}$$

5. TEMPERATURE PROFILES

An indisputable fact emerging from various experimental data indicates that heat-induced change in the blood flow in some tumors is considerably different from that in normal tissue. As noted in Fig2, there was a limited increase in blood flow in tumors during the initial heating period (Song, 1984). When the heating was prolonged, the tumor blood flow decreased progressively. The different responses of the normal tissue and tumors suggest the feasibility of selective tumor heating. A relatively small increase in blood flow in tumors favors retention of heat within the tumor volume, and thus causes greater heat damage. On the other hand, a large blood flow increase in the normal tissue by vascular dilation causes tissue cooling and high survival of cells.

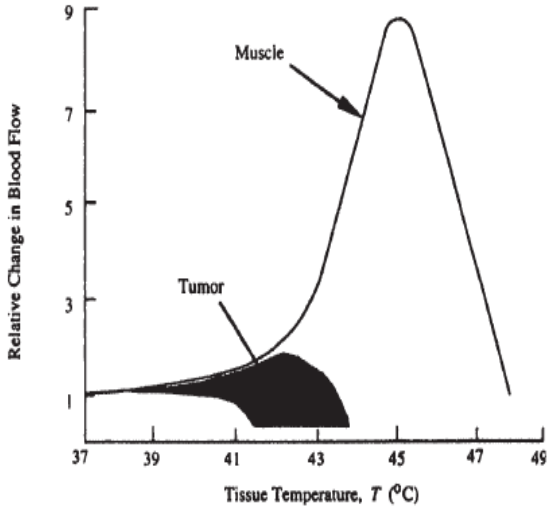

Fig2. Relative change in blood flow with the change in temperature

5.1 Liver Tissue Response Versus Temperature

Tissue temperature elevates when microwave power is applied. Tissue near the active radiation region of the microwave antenna absorbs more microwave wave energy and has higher temperature than tissue further away from the antenna. Heat is also transferred from tissue at higher temperature to tissue at lower temperature by thermal conduction and blood perfusion in the liver tissue [5]. The overall effect of the microwave power is to raise tissue temperature in a limited region near the antenna active radiation region. The critical treatment time required to cause tissue damage depends on the treatment temperature assuming the treatment temperature is constant through the whole treatment duration. To damage liver tissue, the duration needs to be 340 min for temperature at 43 °C, 5.3 min for temperature at 49 °C, 1.3 min for temperature at 51 °C.

5.2 Effect of Incident Power Density

Varying the incident microwave power density changes both the magnitude of the peak temperature, *Tp* and its location zp. Wp also varies with the incident microwave power density: This is clearly borne out by the Fig3. As the incident microwave power density is increased, the peak temperature increases and moves towards the surface. Note that the width of the peak temperature [6]. It is found that the peak temperature varies for the cases studied, from approximately 2 cm for an incident microwave power density of 200 mW/cm2 to about 4.8 cm for an incident microwave power density of 400 mW/cm.

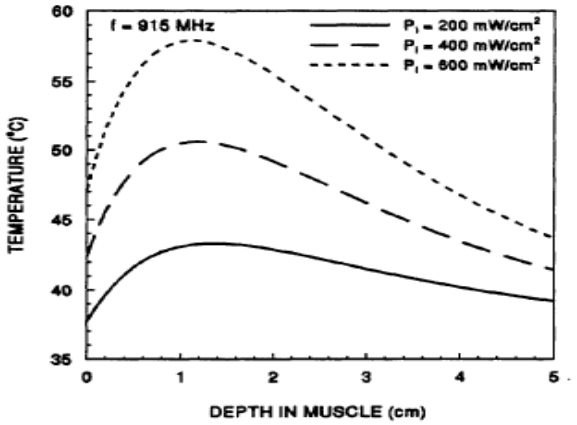

Fig 3. Effect of incident power density on the location of temperature peak.

5.3 Depth Power Profiles

For practical applications of microwave hyperthermia, it is necessary to choose the temperature profiles required and then use a hyperthermia applicator and microwave power level to produce that profile as closely as possible. This problem is the reverse of the analysis problem studied so far. The method used to solve this problem is best illustrated by considering an example. Consider the case in which a tumour of z_1 cm length is attached to a muscle volume of infinite length as shown in fig4.For microwave hyperthermia to be clinically feasible, the entire tumour must be heated to the desired hyperthermic temperature, T_h within a reasonable period of time, while maintaining the surrounding healthy muscle at a safe non-lethal temperatures. In the ideal case, the thermal profile would be a step function. The temperature abruptly rising to a constant therapeutic level at the tumour edge then coming down abruptly at the end of the tumour region. It is well known that the flow rate of blood in tumours is less than in healthy muscle [7].

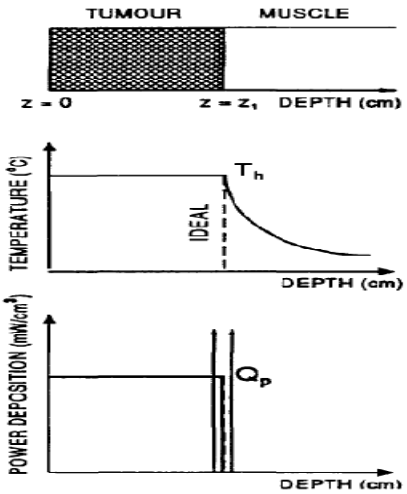

Fig4. Temperature profile and power deposition in a tumour-muscle model

6. POWER REQUIRED FOR HYPERTHERMIA

The incident microwave power densities at the three ISM frequencies of 433, 915 and 2450 MHz, required to produce the hyperthermic temperature, 42^{o}C at varying depths in the muscle, are plotted in the Fig.4**.** It **may** be observed that the incident microwave power density required to achieve the hyperthermic level at higher frequencies is less than that at the lower frequencies for depths of up to 3 cm [8]. As the depth is increased further, the lower operating frequencies require less incident power densities.

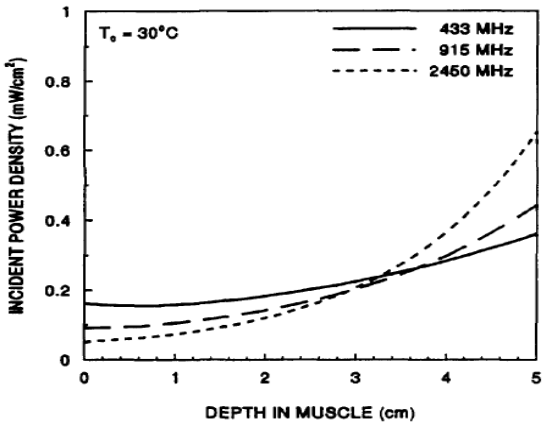

Fig5. Incident power densities required to achieve the hyperthermic temperature

7. CONCLUSION

The steady-state solution of the bioheat transfer equation has been obtained, assuming the biomass to be a semi-infinite homogeneous medium. Effects of various physical parameters on the temperature profile in the biomass, have been studied. From this analysis, it appears to be possible to locate the peak of the temperature profile at the prescribed depth by adjusting the level of the input microwave power and the surface temperature. The study carried out reveals that once the temperature profile peak and its location are prescribed, the width of the temperature peak is determined practically by the physical properties of the biomass: the input microwave power and the surface cooling appears to have very little effect on the width of the temperature peak.

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ANALYTICAL AND EXPERIMENTAL STUDY OF NEYVELI TPS PUMP COLUMN PIPE FOR POSSIBLE WEIGHT REDUCTION – OPTIMUM DESIGN USING ORTHOGONAL ARRAY TECHNIQUE

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ABSTRACT

The aim of this paper is to study the Neyveli TPS pump column pipe for possible weight reduction using orthogonal array technique. In this study 4 factors were identified at 3 levels. The computations were reduced from 81 to9 using Dr. G. Taguchi's technique of orthogonal array which is simpler and less time consuming. Folded plates in Finite elements method (FEM) was used in analytical study while experimentation part was studied using orthogonal array.

***Keywords*:** finite element method, orthogonal array, folded plate

1. INTRODUCTION

This study is an attempt to explore the possibility of reducing the weight of column pipes of Neyveli TPS pump. Stresses develop in column pipe because of the pressure of the water flowing through them and these should have sufficient 'Factor of Safety' (FOS). Stresses in the pipe depend upon a number of design parameters. No simple functional relationship between stresses and design parameters is available. However, given the value of each parameter, it is possible to calculate the stresses in the pipe using Finite Element Method (FEM) employing 'Folded Plate Elements' Important design parameters likely to influence stress and weight of the column pipe were listed out. If each of these 4 factors identified is to be explored at 3 levels, 3^4, i.e., 81 computations are needed in order to locate the best combination through a complete enumeration. Hence, it was decided to approach the problem using Dr. G. Taguchi's technique of orthogonal array which is simpler and less time consuming.

In this study, saving in weight has been attempted only from strength considerations. However, rigidity and chattering aspects should also be considered. After having obtained optimum design from strength considerations, rigidity considerations can be met by providing additional supports, if required. Chattering, if found excessive, can be controlled by providing external stiffeners on the column pipe.

2. COLUMN PIPE ANALYSIS

Bottom column pipe (Fig.1) was selected for analysis, as it was having large flange and hence considered to be the most critical internal diameter of the pipe, outer diameter of the flange, pitch circle diameter of bolts were kept fixed so that functional design is not affected. Number of gussets (n), flange thickness (t_f) , column pipe thickness (t_c) and gusset thickness (t_g) are the design parameters allowed to vary.

2.1 Weight of Column Pipe

For the dimensions shown in Fig.1, weight of the column pipe W , is obtained as given below:

$$W = W_1 + W_2 + W_3 \quad (1)$$

Where W_1 =Weight of Flanges

$$= (\rho \pi t_f / 4) \{D_1^2 + D_2^2 - 2(d+2 t_c)^2\}$$

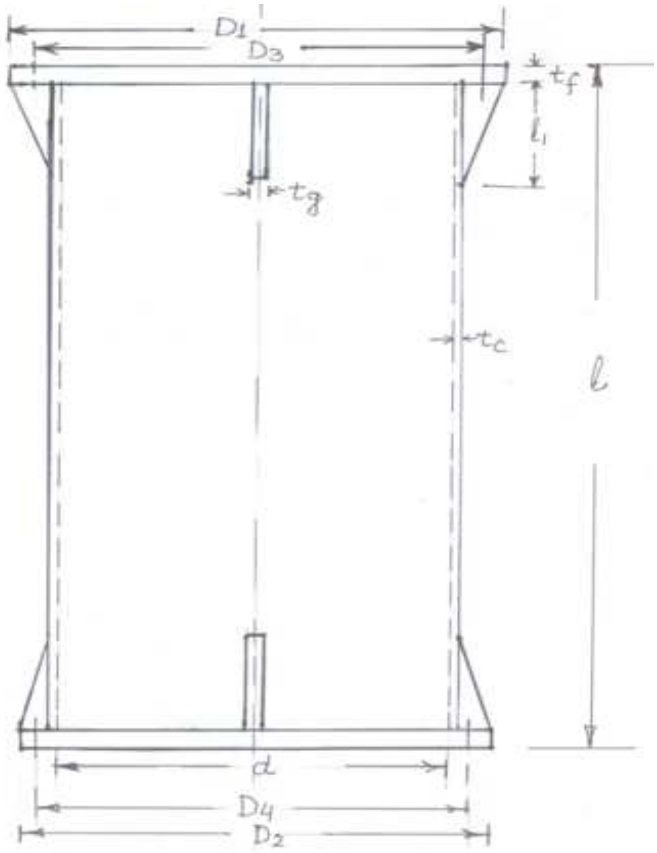
W_2 = Weight of pipe

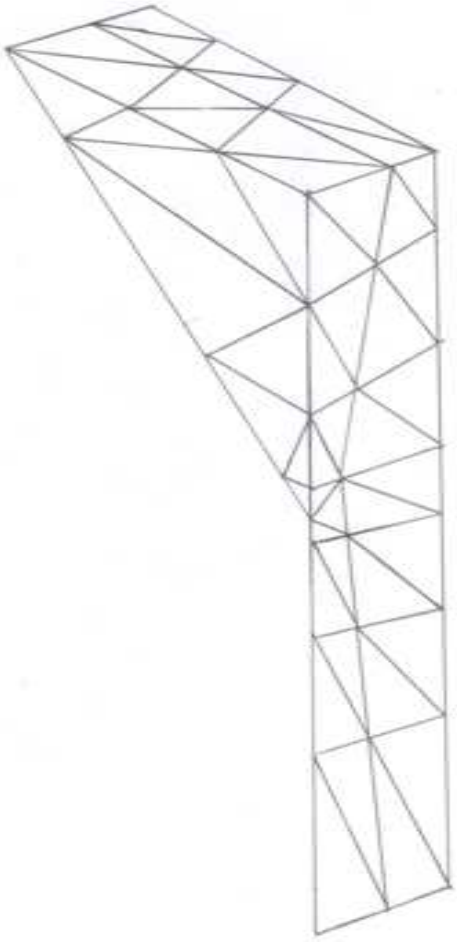
$$= (\rho \pi l /4) \{(d+2 t_c)^2 - d^2\}$$

W_3 =Weight of gussets

$= (\rho\, t_g\, n\, l_1 /4)\{D_1+D_3-2d-4\, t_c\}$

ρ = Density of material (St-42)
$=7.8$ gm/cm^3





d	D_1	D_2	D_3	D_4	l1	l
1270	1700	1475	1560	1400	262	2000

No. of Nodes : 40
No. of Elements : 54
Sector : 1/2n

FIG. 1: Bottom column Pipe

FIG. 2: Idealization of Column Pipe

2.2 Shear Stress in Column Pipe

Since no functional relationships are available for stresses in the column pipe, finite element method (FEM) was used to determine stresses. **Folded triangular plate elements** were used [1]. Using FEM program [2] shear stress in the column pipe for various loading conditions can be obtained. The column pipe is subjected to the following different loading conditions. Refer Fig 3.

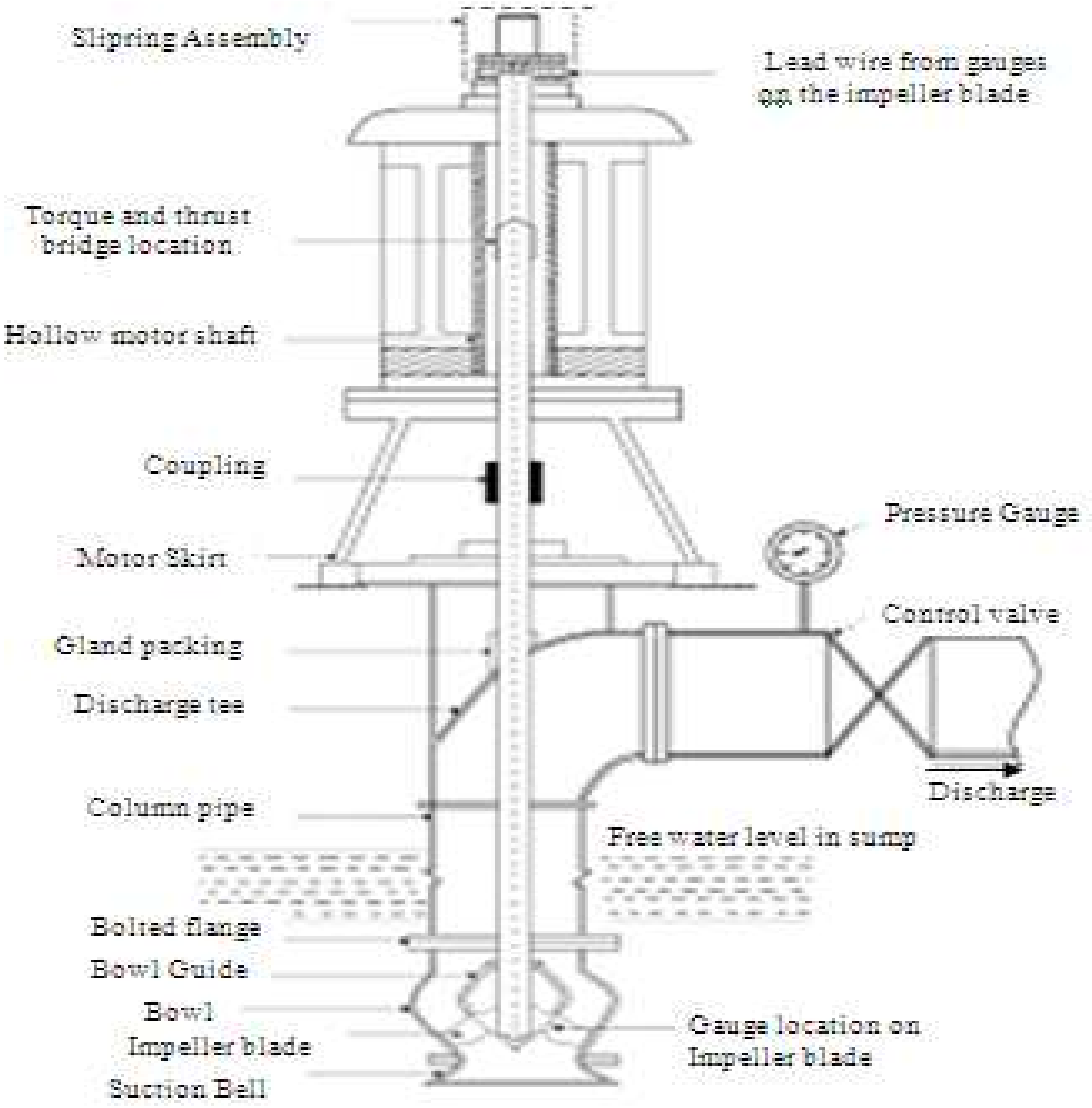


Fig.3 Measurement of torque and axial force in VM PUMPS

3. LOAD CONDITION

3.1 Test Pressure Condition

The column pipe is subjected to an internal hydraulic pressure of 6.75kg/cm^2 for 30 minutes duration.

3.2 Duty Point Condition

During normal operation of pump, the following loads are acting on the column pipe.
Internal pressure =2.431 kg/cm^2
Downward axial force =weight of bowl, suction bowl and water column
= 19480 kg

3.3 Shut off Condition

Occasionally pump operates at shut off condition. During this time, column pipe is subjected to following loads.
Internal pressure = 4.5 kg/cm^2
Downward axial force = 19480 kg
For duty point and shut off condition, erosion allowance of 3 mm is allowed on thickness of flanges, pipe and ribs. Reduced thickness of these parts are used for stress calculation at duty point and shut off conditions.

For test pressure and shut-off condition, nominal factor of safety, η_T, is evaluated as

η_T (nominal) = $[\sigma_y / 2\tau_0]$ (2)

where τ_o = shear stress

σ_y = yield stress of materials in tension

= 2400 kg/cm^2

η_T (nominal)should not be less than 1.5

for duty point conditions, fatigue factor of safety, η evaluated as follows

$$\eta_f \text{ (fatigue)} = \frac{1}{2[\tau_{0/}\, \sigma_y + k_\tau * (\tau_a/\sigma_f)]} \quad (3)$$

Where τ_0 = nominal shear stress

σ_y= yield stress of material in tension

= 2400 kg/cm^2

k_τ = stress concentration factor for shear stress

= 1 (assumed)

τ_a = Alternating stress amplitude (shear stress)

= 0.1 $\tau_{0\ (assumed)}$

σ_f = fatigue limit of materials in axial test

=0.5x σ_u x size factor

σ_u= tensile ultimate strength

=4200 kg/cm^2

η_f (fatigue) should be greater than 2.5

4. DESIGN OF EXPERIMENTS

As mentioned earlier, 4 factors, n, t_c, t_f, and t_g were selected for experimentation. Initially, these 4 factors were assigned 3 levels each as shown in table 1 along with their existing levels.

Factor Code	Description	Levels			Existing level
		1	2	3	
t_c	Pipe thickness (mm)	4	10	16	12
n	Number of gussets	4	16	32	18
t_f	Flange thickness (mm)	20	32	40	32
t_g	Gusset thickness (mm)	6	12	18	12

Table 1: Factors and levels

The factors and levels were assigned in L_9 orthogonal array giving experimental combinations (treatments). For each combination, weight of the pipe was obtained using equation (1). For shear stress calculation, ¼ pipe cross section was idealized for 512mm length. In prescribing boundary conditions deflection along Z–axis for nodes on p.c.d. of bolts was restrained to zero. Stresses were obtained for test pressure conditions. These are shown in Table 2.

Expt. No	n	t_f	t_c	t_g	Weight of column pipe (kg)	Max. shear stress at test pressure (kg/cm^2)
1	1	1	1	1	504.33	4941.74
2	1	2	2	2	1033.57	1838.56
3	1	3	3	3	1513.43	919.70
4	2	1	2	3	944.15	504.67
5	2	2	3	1	1370.06	273.00
6	2	3	1	2	762.70	1377.81
7	3	1	3	2	1283.67	286.65
8	3	2	1	1	640.38	1066.37
9	3	3	2	3	1162.49	441.85

Table 2: Response Table

Analysis of variance (ANOVA) was performed and best combination was picked up. For this best combination, stresses for duty point and shut off conditions were obtained.
Viewing the response table, it was observed that there were quite large differences in the stresses for various experiments. Noting the trend of stresses, levels of various factors were modified as shown in
Table 3 for another L_9 experimentation.

Factor Code	Levels			Existing level
	1	2	3	
t_c (mm)	5	6	8	12
n	15	18	24	18
t_f (mm)	12	14	18	32
t_g (mm)	12	14	18	12

Table 3: Modified levels of factors

To reduce the computer time, FEM program was modified to consider sector symmetry so that 1/2n portion of the pipe need to be considered as compared to ¼ pipe considered earlier. This helped in reducing computer time considerably. Fig.2 shows FEM mesh lay out used for column pipe for 768 mm length.
Experimental measurement of stresses in column pipe was carried out in vibration and stress analysis laboratory of M/s. Jyoti Ltd., Vadodara. These results were compared with those predicted by FEM program with boundary conditions imposed as explained earlier. FEM predicted more stresses compared to experimentally measured stresses. Boundary conditions were modified and deflection along Z–axis with slopes along X, and Y–axis were made zero beyond pcd of bolts. With these modified boundary conditions, FEM and experimental results compared quite well. Hence, for new L_9 experimentation, modified boundary conditions were imposed.
Stress analysis in previous L_9 experimentation showed that duty point condition is more critical than test pressure condition. Hence for new L_9 experimentation, stresses were first obtained for duty point condition and best combination thus arrived at was checked for test pressure and shut off conditions.
Again, factors t_c, n, t_f and t_g were assigned to L_9 orthogonal array. Weight and stress responses were calculated for each combination and these are shown in Table 4.

Expt. No.	t_c	n	t_f	t_g	Weight of column pipe (kg)	Maximum shear stress at duty point (kg/cm^2)
1	1	1	1	1	500.49	632.62
2	1	2	2	2	545.03	690.87
3	1	3	3	3	645.42	699.65
4*	2	1	2	3	612.04	385.95
5	2	2	3	1	638.76	393.51
6	2	3	1	2	610.85	415.03
7	3	1	3	2	759.62	213.27
8	3	2	1	1	696.85	217.08
9	3	3	2	3	784.93	209.24
Existing weight : 1155.27kg						

Table 4: Response Table

5. ANALYSIS OF RESULTS

From Table 4, it is seen that experiment no.4 gave the stresses which are very close to the desired level. Hence, ANOVA was not performed and combination corresponding to experiment no.4 itself was selected as best combination.
For this combination, n_f (fatigue) is calculated using equation (3)

n_f (fatigue) = 1/ 2(385.95/2400 + 38.60/0.5x4200x0.95)

=2.78

For experiment no.4, maximum shear stress in column pipe was determined for test pressure and shut off conditions using FEM program. Values of shear stress and corresponding n_T (nominal) are as follows:

5.1 Test Pressure Condition

Maximum shear stress = 653.872 kg/cm^2 [in element no.54]
n_T (nominal) = 2400/ 2x653.872
= 1.835

5.2 Shut Off Condition

Maximum shear stress = 714.43 kg/cm^2 [in element no. 3]
n_T (nominal) = 2400/(2x714.43)
= 1.68

Finally for experiment no.4, complete column pipe was analyzed. Table 5 shows the results obtained.

Condition	Maximum shear stress in column pipe kg/ cm^2	
	When complete pipe was analysed	When 786mm length was considered
Duty point	300.32 [in element no.37]	385.95
Shut off	558.98 [in element no.37]	714.43

Table 5: Effect of analyzing a portion of pipe

It is evident from table 4 that actual stresses in pipe will be slightly less than those obtained considering 786mm length of pipe.
The weight of column pipe corresponding to best combination is 643.07 kg. against existing weight of 1180.10 kg resulting a saving in weight of 47%.

6. CONCLUSION

Orthogonal array technique has been used to find the optimum level of design parameters of column pipe. Optimum combination has arrived at results in 47% saving in weight from strength consideration. However, rigidity and chattering aspects of the column pipe should also be looked into before adopting the best combination.

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ERP IMPLEMENTATION: A CENTRALIZING FRAMEWORK

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ABSTRACT

ERP implementation is a socio-technical challenge that requires a fundamentally different outlook from technologically-driven innovation, and will depend on a balanced perspective where the organisation as a total system is considered. ERP implementation is considered to rely on behavioural processes and actions. This paper proposes an integrative framework for ERP implementation based on an extensive review of the factors and the essential elements that contribute to success in the context of ERP implementation.

Keywords: Enterprise Resource Planning, framework, communication, training.

1. INTRODUCTION

1.1 As the pace of change accelerates in the twenty-first century as a result of technological opportunities, liberalisation of world markets, demands for innovation, and continually decreasing life cycles, organisations are finding that they have to continuously re-adjust and realign their operations to meet all these challenges. This pace of change has increasingly forced organisations to be more outward looking, market-oriented, and knowledge driven. A useful tool that businesses are turning to, in order to build strong capabilities, improve performance, undertake better decision-making, and achieve a competitive advantage is Enterprise Resource Planning (ERP) Software.

1.2 This paper presents an integrative framework for ERP implementation based on an extensive review of the factors and the essential elements that contribute to success in the context of ERP implementation. The essential elements of this framework, its associated critical factors and its deployment levels are all described in the rest of this paper.

2. INTEGRATIVE FRAMEWORK FOR ERP IMPLEMENTATION

As ERP is a relatively new phenomenon within the software industry, its implementation methodologies are still developing. However, several approaches and methodologies have been introduced by a number of authors and practitioners (for example see Gibson *et al*, 1999; Markus *et al*, 2000).Some of the studies on ERP systems have focused mainly on the operational level of implementation activities, with the assumption that company executives have committed to support the project and that the ERP system package has already been selected, and have not addressed the overall ERP system implementation project. Others discussed critical issues of strategic and tactical levels together as critical factors of implementing an ERP system, without considering issues of project implementation (Bingi *et al*, 1999). On the other hand, some authors and practitioners followed a form of an established generic approach, and added some improvements, changes and extensions.
Successful ERP project implementation is a complex and difficult task. Implementing an ERP system package causes vast change that needs to be managed carefully to get the full advantages (Bingi *et al*, 1999). More importantly, it has been stressed by many that it is really a mistake to view ERP project implementation as merely an IT project.

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3. FOREMOST ERP FACTORS

After the review of the Critical Success Factors, the following is an overview of what are hypothesised to be the Dominant Success Factors for ERP project implementation.

3.1 Top Management Commitment/Support

Top management support has been consistently identified as the most important and crucial success factor in ERP system implementation projects. Slevin & Pinto (1987) define top management support as the willingness of top management to provide the necessary resources and authority or power for project success. Welti (1999) suggests that active top management is important to provide enough resources, fast decisions, and support for the acceptance of the project throughout the company. The top management must be involved at every step of the ERP implementation. They must be willing to allow for a mindset change by accepting that a lot of learning has to be done at all levels, including themselves.

3.2 Project Management

As discussed, ERP implementation is challenging, costly and risky. Consequently, to achieve the desired benefits, the ERP system implementation must be carefully managed and monitored. It is in this respect that project management becomes important, if not crucial for success. Slevin and Pinto (1987) argued that in order to manage a project successfully, project managers must be capable both in strategic and tactical project management activities. With the ERP system implementation context, Bancroft *et al* (1998) suggested that the ERP system implementation is complex, requiring a combination of business, technical, and change management skills. Project management deals with various aspects of the project, such as planning, organisation, information system acquisition, personnel selection, and management and monitoring of software implementation. Peak (2000) suggests that the project management is a practised system necessary to govern a project and to deliver quality products. Hoffer *et al* (1998) argue that the project management activities span the life of the project from initiating the project to closing it.

3.3 Change Management

Change management is a primary concern of many organisations involved in ERP project implementation (Somers & Nelson, 2001). Cooke and Peterson (1998) identify change management, in terms of adopting an ERP system, as activities, processes, and methodologies that support employee understanding and organisational shifts during the implementation of ERP systems and reengineering initiatives. Many ERP implementation failures have been caused by the lack of focus on 'the soft issues', i.e. the business process and change management. Pawlowsiki and Boudreau (1999) point out that almost half of ERP projects fail to achieve expected benefits because managers underestimate the efforts involved in change management. Generally, one of the main obstacles facing ERP implementation is resistance to change. Bancroft *et al* (1998) and Gupta (2000) point out that the resistance to change is one of the main hurdles faced by most companies. Martin and Ching (1999) suggest that to decrease resistance to change, people must be engaged in the change process and helped to see how the change profits them. In essence, Norris *et al* (2000) point out that the tools of management of change are leadership, communication, training, planning and incentive systems. They argue that these tools can all be used as levers and can move great obstacles with a minimum of efforts when applied correctly.

3.4 Training

ERP systems are extremely complex systems and demand rigorous training. Installing an ERP software package without adequate end-user preparation could lead to drastic consequences. Inadequate or lack of training has been one of the most significant reasons for failure of many ERP systems. Clearly, training and updating employees on ERP systems is a major challenge. It has been estimated that by lack of training, about 30–40% of front-line workers will not be able to handle the demands of a new ERP system. Welti (1999) states that the training starts with the education of the project team in system line, project management and ends with the systems users. Moreover, every level in the project class and the various users require different training. The steering committee members need to get a good project overview and a general idea of the system's functionality. The project members, especially the project leaders, must have an in-depth understanding of the system's functionality and project management. The users need to learn those system functions that are related to their jobs, and they must acquire sufficient theoretical background to be able to understand the new processes and procedures.

3.5 Communication

Communication is one of most challenging and difficult tasks in any ERP implementation project (Welti, 1999). Slevin and Pinto (1987) define communication as the provision of an appropriate network and necessary data to all key factors in the project implementation. Communication has to cover the scope, objectives, and tasks of an ERP implementation project. The way to avoid the various communication failures is for an open information policy to be maintained throughout the project. For example, a good e-mail system can help promote this policy, but serious problems need to be discussed by telephone or, preferably, face-to- face (Welti, 1999).

4. ERP IMPLEMENTATION LEVELS

4.1 Strategic Level

The decisions made at this level significantly change the manner in which business is being done and these decisions are the responsibility of top management. This level can be considered as the process of establishing overall goals and of planning how to achieve those goals. Kelly et al (1999) suggested that the strategic level is the premeditated plan for transforming the organisation, enabling it to operate in the new style environment.

4.2 Tactical Level

At the tactical level, also termed managerial level, the medium-term planning of ERP specific organisational issues are largely concerned, where the decisions are made by middle managers. In order to make sure that the enterprise is meeting its targets, objectives of top management are accomplished, and it is not wasting its resources, the tactical level provides middle-level managers with the information they need to monitor the performance of the organisation, control operations, and allocate resources and set policies effectively (Bocij *et al*, 1999).

4.3 Operation Level

Although installing an ERP software package is not as difficult as getting the enterprise soft elements in line with all the change imperatives, its critical role in yielding optimum outcomes from implementation cannot be over-emphasised (Al-Mashari & Zairi, 2000). For this phase, there are numerous tools used during an ERP package system implementation supported by several ERP package vendors

4.4 Client Consultation

Slevin and Pinto (1987) define client consultation as the communication and consultation with, and active listening to all affected parties, mainly the client. It is essential for an organisation to keep its clients aware of its future project to avoid misconception. Slevin and Pinto (1987) argued that the consultation with clients should occur early in the process; otherwise the chance of subsequent client acceptance will be lowered.

4.5 Business Process Change (BPC)

As mentioned before, there are two main options to implement ERP systems: modify the package to suit the organisation's requirements, or implementation with minimum deviation from the standard settings. Research has shown that even a best application package can meet only 70% of the organisational needs (Melymuka, 1998). Therefore, to take a full advantage of ERP software, business process change is seen as a prerequisite. Davenport (2000) points out that the organisational structure and culture, the behaviours of workers throughout the enterprise, and business strategy, all have to be restructured. To this end, Bingi et al (1999) point out that the need to change the organisation's business processes is seen as one of ERP's major benefits.

4.6 Benchmarking

Al-Mashari and Zairi (2000) argue that benchmarking works essentially at capturing both external and internal best practices related to all aspects of ERP system implementation, and enabling the transfer of knowledge across all levels of project implementation. They argue that benchmarking can play a significant role in shaping the strategic direction to be taken for change introduction using an ERP package.

4.7 Going Live

This is the final step of the ERP package implementation; it is also referred to as 'going into production'. It has two major steps: activating the system, and transitioning from the old system to the new system (Computer Technology Research Corporation, 1999). The project team must accompany the productive operation until a sufficient stability of the ERP package has been completed.

5. CONCLUSION

This paper has discussed an integrative framework for ERP implementation. Since the field of IT support systems has moved away from stand-alone, dedicated solutions with localised impact to more integrated, flexible, enterprise-wide systems, a fresh approach was needed. In essence, this is the unique contribution that ERP systems bring with them. Not only do they address organisational systems from a business process change perspective, but also, the software configuration is geared towards creating a seamless and integrated 'value chain'. As far as the relationship between IT and organisation is concerned, ERP systems indicate a radical move from approaches hitherto that tended to have a technical focus towards more appropriately termed 'organisational paradigm shifts'. The current implementation methodologies proposed in the literature are all based on limited experience, and suffer from several deficiencies.

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POLYGON SIMPLIFICATION ALGORITHMS

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ABSTRACT

This paper about the algorithms and methods which are used to reduce the complexity and memory if we are working on graphics images and objects. Lines, polygon, circles are use for designing any image. If we are using polygon in a image then these polygons consist of a large number of vertices; a boundary on a map can easily contain thousands of segments or more. Algorithms that operate on these kinds of polygonal objects often take quite a lot of time, expressed in the number of vertices of the object. We can reduce the vertices which are very close. Design polygon by reduced vertices are known as polygon approximation. This paper about these simplification methods and algorithm.

Keywords: Polygon, Segments, Algorithms, Objects, Image, Approximation

1. INTRODUCTION

1.1 In computer applications, like cartography, computer graphics, image processing and pattern recognition, we often find objects that are internally represented by ordered sets of line segments such as $P = \{p_1, p_2, ..., p_n\}$, also known as polygonal curves or polygons.Very often these polygons consist of a large number of vertices; a boundary on a map can easily contain thousands of segments or more. Algorithms that operate on these kinds of polygonal objects often take quite a lot of time, expressed in the number of vertices of the object.

1.2 In practice these operations can be done much faster by simply operating on an approximation of the original polygon, that quite closely resembles the original while having a significantly smaller number of vertices. Of course the overall geometric structure of the polygonal curve should not change (to much) in the process of reducing the number of vertices.

1.3 There is also the "noise reduction" ability of polygon simplification algorithms. When you scan a shape using a digital scanner, you end up with a two-dimensional array of binary pixels (each pixel can be on of off). It is fairly simple to convert these scanned images to polygonal images (vector graphics) but this method will give very "jagged" polygons with lots of vertices (see Fig-8 for an example).

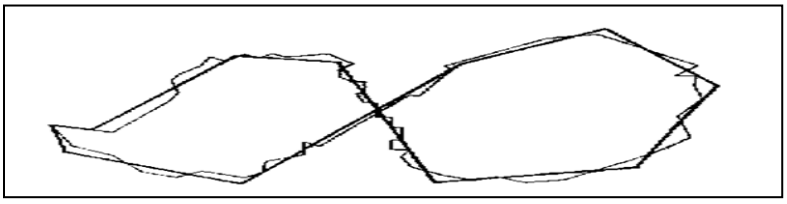

Fig1: Example of polygon simplification

Polygon simplification can be used in this case to get smooth polygonal representations that have kept the overall shape of the scanned image, while having eliminated the noise you got when scanning the image in the first place. Applications of this use of simplification are the recognition of scanned fingerprints and the learning of new fonts in optical character recognition (OCR).

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Figure 1 shows an example of a polygon simplification. The thin lines represent the original polygon which has 70 segments. The thick lines are the simplified polygon. This polygon has only 11 segments. This example was obtained with the minimax method.

2. ERROR CRITERIA

Quite a number of error criteria have been used to determine what a good approximation of a polygon is. Some of these are listed below (see Figure 2). The error of a line segment $\{p_i , p_j\}$ $(i<j)$ can be defined as:

1. The maximum of the distance between the segment and all points p_k (ikj);
2. The maximum distance between the line connecting p_i and p_j and the points p_k (ikj) (called the "parallel-strip" criterion in Eu and Toussaint [1] and Imai and Iri [3]);
3. The minimum width (divided by 2) of a rectangle containing all the points p_k (ikj) such that p_i and p_j are on its two opposite sides, which are orthogonal to segment $\{p_i , p_j\}$ (the other two opposite sides being parallel to $\{p_1 , p_j\}$), where the width of rectangle is the distance of the two sides parallel to $\{p_i , p_j\}$. The error $\{p_i , p_j\}$ is + if no such rectangle exists;
4. The minimum width (divided by 2) of the rectangle which contains all the points p_k (ikj), where the width of the rectangle is the smaller of the distances of between the pairs of sides.

3. NATIVE APPROACH

A very simple approach to the simplification of polygons is to take only every n^{th} vertex of *P*, where *n* is number between 1 and the number of vertices of *P*, and discard all the other vertices. While this *O(n)* approach almost seems to stupid to be useful, there are in fact some applications for it.
The Geographic Information System (GIS) called the "Interactieve Atlas" for instance, that was written by a group of students from the Utrecht University during their Software Project, uses this simple algorithm when drawing a little overview map of the whole world.

4. MINIMAX APPROXIMATION

We will first look at the problem in general; after that some algorithms are given for the process. In the approximation of a polygon there three different case. Kurozumi and Davis called these the simple model, the general model and the final model. We will discuss these models below.

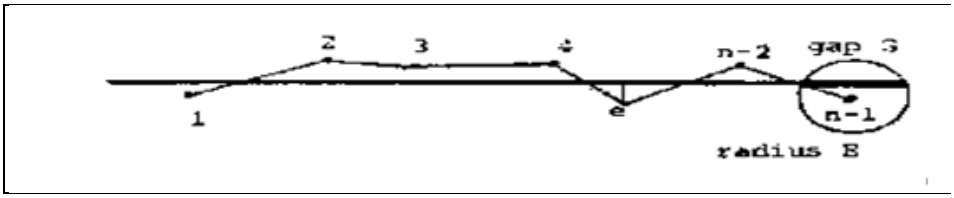

Fig 2: The simple model of minimax simplification

The simple model (Figure 2) is the problem of finding an approximating line through a numbered set of points without any further restrictions. The process starts with some points and keeps adding the next point and then calculates the approximating line and error until that point would result in an approximating line that would be more then the specified error away from the points. Then this last point *n* is not used. A circle around the last point of the approximation (point *n-1*) with radius $E = e$ is drawn and the line segment of the approximating line that lays within this circle is called the allowable gap *G*.

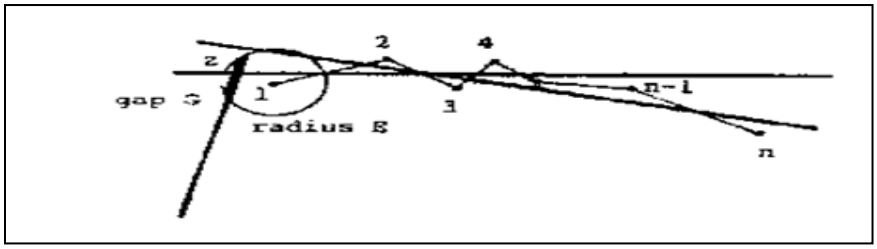

Fig 3: The general model for minimax approximation

The general model (Figure 3) is the problem of finding a maximum length approximating line through the next points in the set that matches the previous line. This means that the beginning of this line must fall within the allowable gap *G* of the previous line. According to Kurozumi and Davis "this problem is difficult and a complete general solution is not yet available" but it is possible to do a constrained approximation in which the approximating line must go through the second point *Z* of the allowable gap. So the approximating line has to go through this point.

5. ALGORITHMS

To approximate a polygon using the minimax method four algorithms are given here. The first finds the minimax distance in a polygon. This is the minimum side-to-side distance of that polygon. The second finds the minimax approximated line (used in the simple model) using the first algorithm and an algorithm for computing the convex hull of a set of points. This is the smallest convex polygon that contains all the given points. Kurozumi and Davis call this the maximum polygon and they give an algorithms for calculating it. The third algorithm is the constrained approximation and the fourth algorithm uses algorithms 2 and 3 to approximate a polygon (the min-# problem).

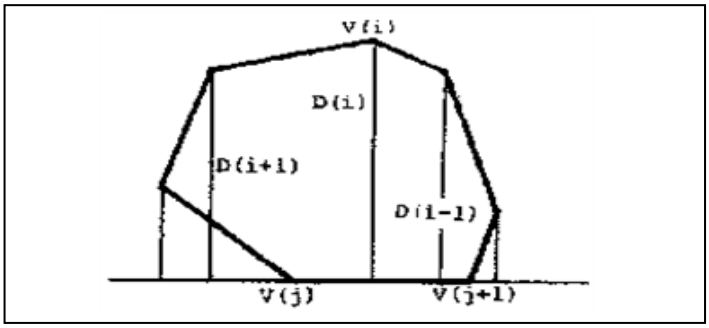

Fig 4: The minimax distance in a poygon.

Algorithm 1
Minimax approximation
Determine the side $p_j\, p_{j+1}$ that has the minimax distance:
Calculate all n distances and take the smallest
Determine the point p_i that has the maximum distance to side $p_j\, p_{j+1}$:
Start by examining the vertex that is n/2 vertices away from p_j (the best probable candidate) and then increase/decrease i based on the distances of the points p_{i-1} , p_i and p_{i+1} to side $p_j\, p_{j+1}$ to find the largest distance This algorithm takes the vertices of a convex polygon (and the number of vertices) and calculates the minimax distance in the polygon.

Algorithm 2
Calculate the convex hull of the input points
Calculate point p_i , side $p_k\, p_{k+1}$ and minimax distance D with Algorithm 1 (giving it the calculated convex hull as input) Let S be the slope of the side $p_k\, p_{k+1}$
Let F be the perpendicular projection of point p_i onto side $p_k\, p_{k+1}$
Let X0 and Y0 be the coordinates of the middle point between points p_i and F
The minimax approximated line is Y = S*(X-X0)+Y0 and the maximum error is D/2
This algorithm takes a set of points and their number and calculates the minimax approximated line for the points and the maximum resulting error.

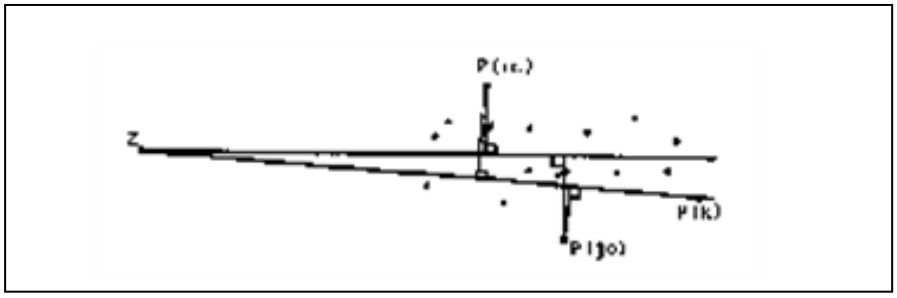

Fig 5: The Constrained approximation

Algorithm 3
Calculate the two initial values i0 and j0:
Find point p_k, the point that is farthest away from given point Z
All the input points are divided into two parts by the line between point p_k and Z (Zp_k). Let the farthest two points from Zp_k be i0 and j0
Search for the points at the maximum distance from the line:
i = i0, j = j0, array D(k) = for all elements from [1..n], E = 0
While D(k) E for all k from [1..n]
The line L passing through Z and having the same distance E from points p_i and p_j is given by Y = S*(X-X0)+Y0 where:
Xi = x-coordinate of p_i, Yi = y-coordinate of p_i (analogous for p_j of course)
S = (Yi+Yj-2*Y0) / (Xi+Xj-2*X0)
For all input points p_k (k from [1..n]) calculate the distance of the point to line L and put it in D(k)
E = S(Xi-X0)+Y0-Yi*
Return S and E
This algorithm takes a set of points, their number *n* and a point *Z* = (*X0,Y0*) and it calculates the slope *S* of the constrained approximationline *Y=(S*(X-X0)+Y0* and the maximum error *E*.

6. TIME COMPLEXITY

Building *G(P,e)* from *G(P)* will cost $O(n^2)$ time because *G(P)* contains $O(n^2)$ arcs. Thus, the min-# problem will need $O(f(n)+n^2)$ time if building *G(P)* from *P* can be done in *f(n)* time. The min-e problem will need the sort all the $O(n^2)$ weights in *G(P)*. This can done in $O(n^2 \log n)$ time. The binary search will have *O(log n)* steps that each need to find a shortest path, which costs $O(n^2)$. From all this follows that the min-e problem can be solved in $O(f(n)+n^2 \log n)$ time.

7. CONCLUSION

7.1 We have seen what polygon simplification is, why it is so important and where it can be used and we also some methods that can be used to simplify polygons. Some of these methods are the minimax method, using graphs in which to search for a shortest path and the method by Hobby which minimizes the number of inflections of the input curve.

7.2 The presented methods of polygon simplification use different means to, in a way, get to the same result: approximating polygons or polygonal curves. However, there are quite some differences in approach, intended use and their use of different techniques to achieve their goal.

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A NEW FLAVOUR OF OUTSOURCING IN CLOUDS

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ABSTRACT

Computing is in a state of constant change. However, the paradigm of security in today's age of innovation is seldom constant. After the success of Business Process Outsourcing (BPO) and Knowledge Process Outsourcing (KPO), now companies are considering Cloud Computing Outsourcing (CCO). Applications today are migrating towards the cloud. Cloud computing is a fresh flavor of outsourcing, possessing momentum and mindshare for solid reasons. With cloud computing, all our IT needs are taken away and given to a third party to manage. Companies tap their data and applications over internet and intranet instead of local servers. In today's economic climate, where IT budgets shrink, the Cloud Computing infrastructure reduces operating costs. The potential gains are enticing. However, companies become a little sensitive about data. The internet needs to be much more secure before users can move completely into the cloud. It is a very scary scenario. When we consider shared resources in feat that necessarily mean shared security risks. The evolving security matrix is complex and calls for coordination at the highest order. This paper focuses on technical security issues arising from the usage of cloud services.

Keywords: *SaaS, PaaS, IaaS, data center, CIA model.*

1. INTRODUCTION

Cloud Computing is a fundamental architectural shift spreading through the business world. We're entering a new era of computing, similar to the change from mainframes to PCs, from programming through punched cards to user friendly iPods where everything is a fingertip away.

1.1 Internet-Based Computing

Internet-based computing, also known as "Cloud Computing," is one of the latest trends in digital media. The idea is that people can access information through data centers anywhere with an Internet connection. Companies such as Google, Microsoft and Amazon are working on perfecting their 'clouds'. Cloud Computing is about how an application or service is deployed and delivered. Cloud computing supposedly offers virtually unlimited, on-demand computing resources. Applications now live in a new platform-a Cloud Computing, and thus take advantage of the seemingly limitless processor cycles, memory storage, and network bandwidth along with extensive software capabilities.

1.2 Physical Security

Development of computing environments requires more adaptability. Systems specifically must be less static, more configurable-on-the-fly, and support collaborative principles i.e. on-demand resources that can be shared across teams. However, many of the same questions that applied to outsourcing could be applied to Cloud Computing. For example, what is the physical security of the facility? Two of the different issues with Cloud Computing are data ownership and privacy.

2. CLOUD ARCHITECTURE

The Cloud Computing architecture comprises two significant parts: the front end and the back end. The front end is the side at which the user of the computer or the client himself is able to access. This involves the client's network or his/er computer and the program(s) that s/he uses to access the database or the servers that contain all the data. The back end of the Cloud Computing architecture is the cloud itself, which is the collection of all related information saved in the servers that the client wishes to have access to. These two ends of the Cloud Computing architecture are connected through a network, usually the Internet, because it provides remote access to all the users of the cloud as shown in Fig 1.

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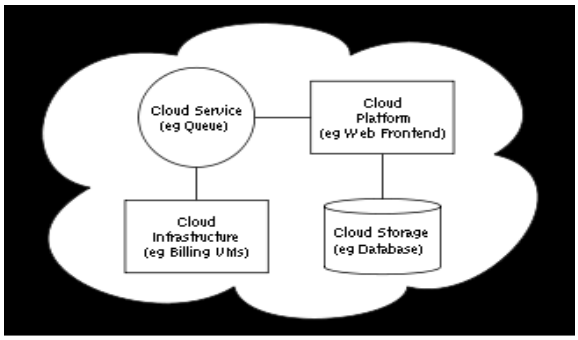

Fig 1: A Simple Cloud Architecture
SOURCE: http://en.wikipedia.org

2.1 The Cloud computing technology requires specific software and hardware for it to function the way its users want it to be. For large-scale businesses (LSB), the Cloud Computing technology eliminates the need to buy an additional number of hardware for all employees, since all data needed would be easily accessible through the individual computers. Installing software in every computer would no longer be necessary because the cloud computing platform would be able to do the job. The Cloud Computing platform contains all the necessary functions and software for easy access and computing of the cloud.

3. DATACENTER DESIGNS

The data center could be considered as the backbone of Cloud Computing architecture. The destruction of it could easily mean millions of dollars in additional spending for companies. Data centers of large companies are often kept secret to avoid infiltration either by hacking or actual physical damage. As a business model, cloud providers can pass on the economies of scale of huge centrally managed and operated data centers and the green virtues as well.

3.1 Data centers for Cloud Computing architecture are not as mundane data processing centers. It comprises different servers with optimal storage capacity and processing speed. They work together to ensure that the application will be operating as expected. The area is usually in a highly controlled environment where it would be constantly monitored through various applications and manually checked for actual physical problems.

3.2 Data Center Energy

Data Centers worldwide already consume as much energy as the whole of Netherlands [1]. Moreover; these machines are multiplying at a staggering rate. The energy consumed by data centers in the U.S accounts for 1.5 percent of national consumption. If this aspect is left unchecked, the figure will quadruple by 2020 [2]. Most data centers are terribly wasteful, too. An analysis by the department of energy from April, 2009 concludes that facilities, on average, convert only 15 percent of the energy they consume into useful computing and could be made up to 50 percent more efficient. This bewildering array of "energy use problems" can be turned to a big opportunity. In fact, most data centers have much more capacity than they actually need, as the temptation is overprovision in case of failure. This means that approximately 30 percent of data centers are finally "dead" at any one time [3].

3.3 Wipro has datacenters in Mysore and Noida offering a variety of cloud services, including a core banking solution for cooperative banks and regional -rural banks.
Amazon and other companies working on their clouds have "done a lot" to address security concerns. "Amazon has a single Cloud Computing environment; multiple data centers but in the same environment. Those things we put up there might run in a data center in different machines, the same machine in the same data center, or different machines in a different data center. But it's the resources in the same environment," Cearley[1] says.

4. ELASTIC COMPUTER CLOUD (EC2)

Elasticity is the cloud's true virtue. When a cloud-deployed application becomes busy, it merely requires more resources. This is a dramatic difference from the traditional approach. The elasticity offers a new, low -cost way to scale applications both up and down while paying for only what the applications use. Lotus and web sphere on SUSE through its elastic computer cloud (EC2) service is a sign of growing importance.

[1] David Cearley -As Gartner analyst.

5. THE CLOUD INROAD

Globally, Cloud has made inroads into our daily lives. Web-mail or web-based e-mail such as Hotmail, Gmail, or when we use Google Documents instead of MS word are all cloud applications, which means web floating on clouds. Thus, it is not as new as it sounds. What is new is increasing use of clouds for enterprise applications.

5.1 While we are far ahead than the western countries in all other technologies, China is far ahead of us with respect to clouds. Recently, 1,021 developers were surveyed [4] and found about 4 percent are currently deploying applications to the cloud. Outlook 2010 research[5] found 10 percent of companies doing some kind of cloud computing, meaning online CPU, storage etc., but not including SaaS , and another 5 percent absolutely planning to do it. Both these data points to a clear reality: Cloud Computing is in very early adopter stage.

5.2 Fig 2 depicts the current status of an organization via cloud offerings:

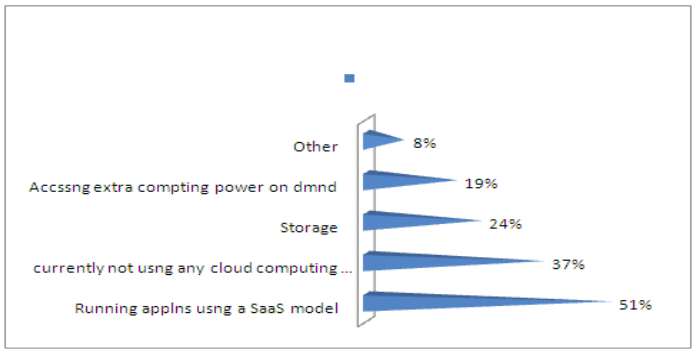

Fig 2: Status of organization currently Using Cloud Offerings

SOURCE: CIO Research

5.3 Like every other technology, cloud computing has its place," wrote one respondent to this survey. "Mobile access, non-mission-critical capabilities, and general support functions (provisioning, e-mail, etc.) are easy targets."

5.3.1 Fig 3 paints the plot of a survey describing plans/usage of the following cloud offerings.

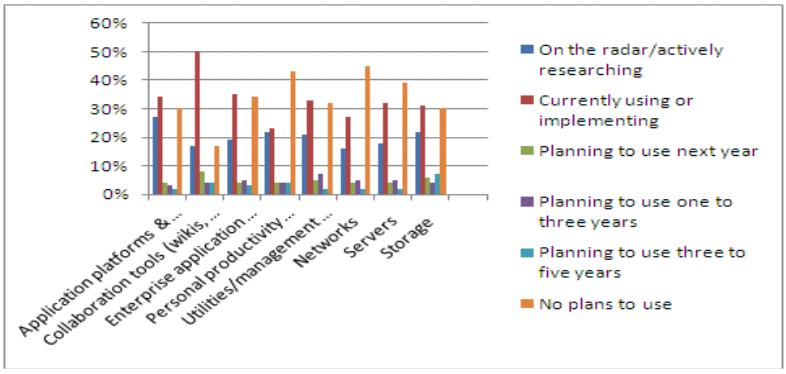

Fig 3: Plans describing some Cloud Offerings

SOURCE: CIO Research

According to Paul Roerhrig, director, cognizant, his company is making significant investment in alliances, skill, and new technologies to ensure that cloud enabled solutions will be a source of significant value.

6. CLOUD LAYERS

A cloud layer comprises five gears in the role of client, application, platform, infrastructure, and server

6.1 Cloud Client

A cloud client consists of computer hardware and/or computer software that relies on cloud computing for application delivery, or that is specifically designed for delivery of cloud services .Examples include some computers, operating systems, browsers, phones and other devices.

6.2 Cloud Services

6.2.1 SaaS

Cloud application services or "software as a service *(SaaS)*" deliver software as a service over the internet, eliminating the need to install and run the application on the customer's own computers and simplifying maintenance and support. Key characteristics include:

- network-based access to, and management of, commercially available (i.e., not custom) software.
- activities that are managed from central locations rather than at each customer's site, enabling customers to access applications remotely via the Web.
- application delivery that typically is closer to a one-to-many model (single instance, multi-tenant architecture) than to a one-to-one model, including architecture, pricing, partnering, and management characteristics
- centralized feature updating, which obviates the need for downloadable patches and upgrades.

6.2.2 The most widespread of practical type of Cloud Computing is SaaS and we are embracing that in a big way. Analysts position India as the fastest growing SaaS market in Asia pacific [6].

6.2.3 Cloud Computing offerings that fall under what most people think of as software on demand or SaaS, in the style of Salesforce.com, have been around for years now. Salesforce, the US based company has revolutionized the CRM space with its on-demand offerings. There is none of those huge upfront costs or the bother of managing the system.

6.2.4 One of Bangalore's luxury property developers, *Total Environment* has just gone live on salesforce.com's customer relationship management (CRM)solution [7]. The alternative solution was to go the conventional way; buy servers, storage and networking gear, installs on them a CRM solution from somebody like Oracle after paying a big license fee, and keep staff to manage the entire system and worry about upgrading. Thus in the line of technophiles, Total *Environment* is computing in the cloud.

6.3 Paas and IaaS

Looking at developments in cloud computing, there is a new transform in the town beyond SaaS, platform as a service (PaaS), and infrastructure as a service (IaaS).

6.3.1 Cloud Platform

Cloud platform services or "*Platform as a Service (PaaS)*" deliver a computing platform and/or solution stack as a service, often consuming cloud infrastructure and sustaining cloud applications. It facilitates deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers.

6.3.2 Cloud Infrastructure

Cloud infrastructure services or "*Infrastructure as a Service (IaaS)*" delivers computer infrastructure, typically a platform virtualization environment as a service. Rather than purchasing servers, software, data center space or network equipment, clients instead buy those resources as a fully outsourced service. The service is typically billed on a utility computing basis and amount of resources consumed (and therefore the cost) will typically reflect the level of activity. It is an evolution of virtual private server offerings. Every traditional service provider and Telco is now setting up infrastructure for cloud solutions. Earlier this was limited to a few like Amazon, Google, Rackspace, Terremark, GoGrid, Joyent and Iron Mountain. Now Syntel, NTT, AT&T, BT, Orange, Wipro, TCS, IBM and Dell etc., are all building cloud infrastructure.The move from a physical infrastructure to a virtualized infrastructure has also benefited the company in terms of power, cooling and storage requirements. Studies show that by putting infrastructure on the cloud, enterprises can save costs by as much as 30 percent.

6.4 Cloud Server

The servers' layer consists of computer hardware and/or computer software products that are specifically designed for the delivery of cloud services, including multi-core processors, cloud-specific operating systems and combined offerings. The cloud eliminates expensive server farms and allows companies to analyze petabytes of data. Data storage and back up too are often undertaken on remote servers.

7. CLOUD APPLICATIONS

Today, countless business and individuals access their email and documents on remote web-based systems. Social networking tools, such as MySpace, Facebook, and Twitter maintain data on remote servers accessed through a web browser. Currently, one can create cloud applications through two major implementations [8]:

- Amazon Web Services(AWS)
- Google Application Engine(GAE)

7.1 AWS and GAE are vastly different in the development and deployment models. Amazon offers traditional computer resources, such as processors, memory, file system/data base, and messaging. AWS offers the cloud at two distinct levels-raw computing resources and ready-to-go appliances. While AWS concentrates on computing resources, the GAE focuses on computing capabilities released via the Google SDK by leveraging an agile language (Python) and well-known RIA framework.

8. INDUSTRY SUPPORT

Cloud Computing is an IT architecture, which helps companies meet their IT needs without having the expensive infrastructure. In terms of Industry support for the concept, IBM is teaming up with Amazon web services for the latter to provide cloud-based access to DB2.

8.1 The world's top software producer, MS and top PC maker HP are in a 3 year agreement to invest $250 million for Cloud Computing [9]. MS, that relies on packaged software and software licenses for its livelihood is talking about Windows Azure, Windows server in the cloud. HP-MS will collaborate on Windows-Azure platform, i.e., MS's cloud platform.

8.2 Oracle has several cloud solutions, including in CRM to challenge Salesforce. SAP is experimenting with a cloud offering of its ERP called Business By Design (BByD) as is the Chennai based Ramco Systems.

9. BENEFITS

Google says there are benefits for the company and consumers to switch to the cloud. Eran Feigenbaum[2] indicates "this technology enables people to quickly turn on applications and innovation like a utility, instead of having to install and run their own applications." "We also place a great deal of importance on being able to take your data off our servers if you choose." The benefit to cloud computing is that you can scale up to use resources, or scale down to use resources. One of the downsides is that you are running in the same data centers as other people."

9.1 The Cloud Computing technology requires specific software and hardware for it to function the way its users want it to be. For large-scale businesses, the cloud computing technology eliminates the need to buy an additional number of hardware for all employees, since all data needed would be easily accessible through the individual computers. Installing software in every computer would no longer be necessary: because the Cloud Computing platform would be able to do the job. All the necessary functions and software for easy access and computing of the cloud is embodied in the Cloud Computing platform. In a nutshell the benefits are listed in Fig-below.

Even large enterprises are exploring the financial flexibility that cloud provides. Almost half of all internet users are utilising cloud resources in some shape or form.

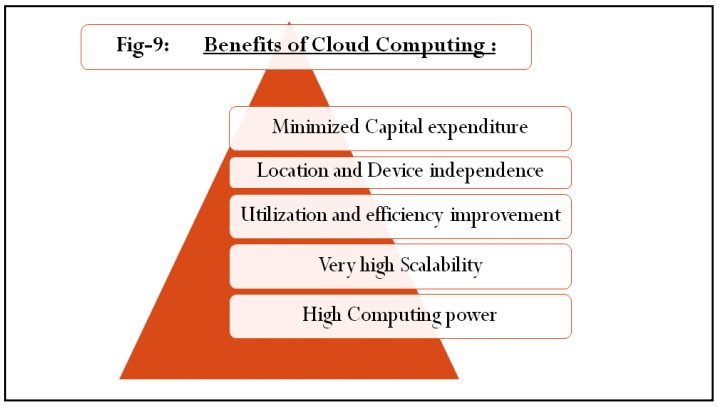

Fig 4: Benefits of Cloud Computing

While the cloud is growing, it is probably the timely concern to address the issue of data and service security.

[2] Eran Feigenbaum, Director of security for Google Apps.

10. PLAUGING ISSUES

While Cloud Computing provides compelling benefits, it is the new architectural trend in scalable distributed computing. Besides the limitations of broad band requirements, there are other concerns such as security, incomplete control over IT infrastructure, privacy or critical data on the clouds. Cloud also poses a set of challenges with response time. The problem is that the user has to cross the cloud to get to the data center making it prone to high packet loss and latency in transmission. There are some confidentiality and integrity issues.

10.1 SConfidentiality indicates that all data sent by users should be accessible to only legitimate receivers and integrity means all data received should be sent/ modified to legitimate senders. Although public key encryption, X.509 certificates and the secure Socket Layer (SSL) enables secure and authentication communication over computer networks, security measures have to be taken so as malicious users cannot bypass certain security restrictions to gain escalated privileges.

11. SECURITY MEASURES TAKEN

Security is to save data and program from danger and vulnerability. Dangers involve disrupt services, theft of information, loss of privacy, damaged information etc. Vulnerabilities entail hostile program, eavesdroppers, malicious users etc. “No security system is 100 percent secure, and anyone who says otherwise can’t be trusted,” says Feigenbaum[2]. Many data breach incidents are the result of -

- improperly configured systems
- slow software patching
- stolen or lost portable devices -like laptops and USB keys.

All needed have been done to minimize these risks.” Undoubtedly, cloud computing is highly distributed. A service-based model also would render many of today's existing security architectures obsolete. Security architects would need to re-examine assumptions and derive at a security model that can be implemented in a distributed, cloud infrastructure.

12. THE CIA MODEL

The CIA model of information security deals with Confidentiality, Integrity, and Availability as in Fig 5.

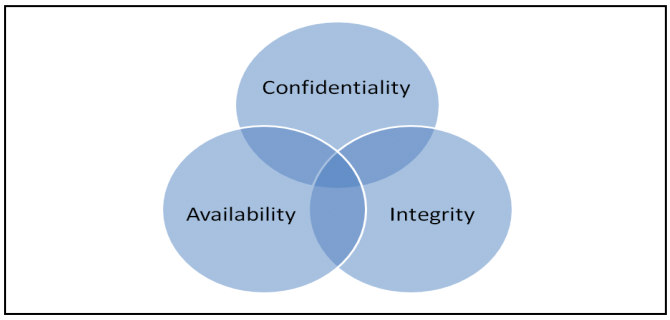

Fig 5: CIA Model

12.1 First, the customer needs to know that data is encrypted so prying system administrators at the cloud data center can't troll through the data for exciting pieces.

12.2 Integrity relates to the integrity of the data, in that it changes only in response to duly authorized transactions. So we need standards to ensure that, which don’t exist yet.

12.3 The last nagging security issue is availability- will the data be there whenever needed? The answer here is an unqualified "maybe". In February of this year, Amazon's Simple storage service (S3) went down for almost four hours, wreaking havoc on several companies that use and depend on the S3 Cloud. Amazon ascribed the cause to an unexpected spike in customer transactions.

12.4 There are some best practices for organizations wanting to protect private data [10] as mentioned below.

12.4.1 Ensure that the data is encrypted both ways across the Internet using SSL, as well as at rest in the cloud vendor's storage pool. Ensure that the customer controls the encryption/decryption keys, just as if the data were still resident on owner’s servers.

12.4.2 Ensure to have clauses in the cloud contract that the data always belongs to you, that you can reclaim it any time with short notice, and that the cloud vendor may not disclose any of your data to any third party.

12.4.3. If possible, have users provide two-factors to be authenticated to the cloud systems. That is, not only just a password, the much-maligned and weak single factor but also present either a physical token, such as a smart card, or a biometric, such as a finger print. It should be as difficult as possible for the unauthorized to gain access to the cloud system and then to relevant data.

12.5 Cloud Computing Security

Cloud Computing security mainly concerns with different layers such as physical layer security, network level security, virtualization level security, management level security, and other general issues. Also, we need security at different levels: server access security, internet access security, database access security and program access security. The evolving security matrix is complex and calls for coordination at the highest grade.

12.5.1 The network level latency problem, which Akamai's[3] Sure Route technology tackles as it takes a good route to the internet and accelerates the transmission by tunneling the traffic through Akamai servers at various points [11].Traditionally, routing data through internet networks is done by Border Gateway Protocol (BGP) and Transmission control protocol (TCP). Both were invented 30 years ago and are inefficient at transporting data in today's standards. TCP has a number of efficiencies -it is a "chatty" protocol. There is a lot of back and forth and a lot of packet loss with TCP.

12.5.2 So, Akamai created TCP optimization technology. Also compression is used to reduce the packet size. Sure Route helps in redirecting traffic to alternative routes when communication links such as submarine cables are severed.

12.6 Yunis [12] has developed a model to assess all the various risks associated with relocating an organisation's data and services to remote computer servers in the clouds. "The model can be applied in assessing the security issues emanating from Cloud Computing, identifying the security counter measures needed to address these issues and coordinating the efforts of the various participants to enhance information security in organisations adopting Cloud

12.7 The management of security risk involves users, the technology itself, the cloud service providers, and the legal aspects of the data and services being used. Yunis (2009) states "this last point is critical given the fact that most cloud providers, if not all, do not meet the current compliance rules and regulations".

12.7.1 Understanding and controlling security risks when using Cloud Computing must be based on an analysis of the potential losses against potential benefits and cost savings (originating from using scalability and low cost of cloud computing) compared to conventional data storage and processing.

12.7.2 The relative security of cloud computing services is a contentious issue which may be delaying its adoption. Some argue that customer data is more secure when managed internally, while others argue that cloud providers have a strong incentive to maintain trust and as such employ a higher level of security.

13. DATA CENTER SECURITY

Security concerns arise as both data and program reside in the provider premises. Data center policies are generated when a user provides sensitive information that travels with that information throughout its lifetime to ensure that the information is used in accordance with that policy. Professional security staff utilizing video surveillance, state-of-the-art intrusion detection systems, and other electronic means should be logged and audited routinely. When an employee no longer has business and yet need to access data center, his/er privileges to access data center should be immediately revoked. Provider needs also to make a contractual commitment to obey local privacy requirements on behalf of their customers.

14. PAYMENT METHODOLOGIES

Applications only pay for what they use. The payment methodology for customers is based on an affordable pay-as-you go model, which provides optimum utilization of resources, thus enhancing productivity and profitability of enterprises.

[3] Akamai Technologies, Inc., A company providing a distributed computing platform for global Internet content and application delivery. The company's headquarters are in Cambridge, Massachusetts. One of the founders Daniel Lewin, then MIT graduate student was killed aboard American Airlines flight 11 which crashed in the September 11 attacks of 2001.

14.1 For example, a Prognosys, a market intelligence provider in Delhi, BByD' s first customer in India, experiences a total cost of just around Rs. 1.4 lakhs a month for 25 users. Whereas, with the traditional ERP application, it would have incurred a capital expenditure of Rs. 25-30 lakhs, and another Rs.10-12 lakhs a year to keep it running .But in the case of BByD, SAP hosts the solution, maintains it and upgrades it, while Prognosys uses a 2-mbps line to draw in the solution , and pays Systems Applications and Products(SAP)at the rate of Rs. 5610 per user per month. This means a significant increase in working capital.

15. CONCLUSION

From a buzzword, Cloud Computing is starting to mature and is likely to be ready for primetime soon. Cloud computing is a mix of many methodologies and one has to have proficiency in software development and porting to understand it. Over and above the need for software and hardware professionals, there would be a need for IT security professionals who will find a major place in the Cloud Computing environment. However, in the long run, Cloud Computing is the way for homogeneous computing in a universal environment, i.e. a Cloud Computing accessible to all at an affordable price. Cloud Computing will be as transformative for businesses as ERP was in 1990s [13]. This model will have immediate relevance to small and medium businesses (SMBs) by equipping them to automate business processes without large upfront investments in hardware and software.

There are real security issues with cloud computing, but in the future, all these will be addressed for large and small businesses (LSB) [14]. A company will not always put a small amount of information in an external environment, whether it is a cloud computing environment or a hosted-source environment. If the cloud is where you want to be, the sky is the limit. It is expected that new models, new buyers, new metrics and new channels will shape the software business in coming year and beyond.

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TECHNICAL EDUCATION FOR THE CHANGING WORLD – AN INDIAN PERSPECTIVE

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ABSTRACT

In the current era of globalization and internationalization, for the world economic growth, the capital resource has been replaced by the human resource. Since the technological developments play a vital role in economic development, technical and skilled personnel become the key component of human resource. Technical education system is responsible for producing technical and skilled personnel. This paper emphasizes that technical education should be relevant, attractive and connected. The technical knowledge and hard skills have to be acquired through constructivism. Learning soft skills; developing learning attitude; and creating positive aptitude to be part of regular learning.

Keywords: Economic growth, constructivism, attributes of engineering graduates, GDP, Technical Education, Knowledge, Attitude, and Aptitude.

1. INTRODUCTION

There can be no doubt that higher education has made a significant contribution to economic development, social progress and political democracy in independent India. It is a source of dynamism for the economy. It has created social opportunities for the people. It has provided a beginning for the creation of a knowledge society. India's technology policy needs to be reformulated in the light of the emerging international economic environment to capitalize on the accelerated global development and diffusion of technologies and keep pace with more demanding international standards for cost, quality and productivity. The imperatives of globalization and internationalization demand prompt and purposeful responses and proactive initiatives if we want to achieve competitiveness, productivity and national prosperity. India's technological capabilities are going to play a vital role in overall development of world economy not only in information technology but also in manufacturing technology. Knowledge and skills in technical education can be better acquired by constructivism, a new learning technique, which may be most relevant model of learning in technical education system for India. Indian graduates must focus on developing soft skills; learning attitude; and positive aptitude apart from learning the technical knowledge and hard skills.

2. ROLE OF TECHNICAL EDUCATION IN THE WORLD ECONOMY

In recent years, significant changes have taken place across the globe. These changes can be seen in terms of globalization and internationalization of economic system followed by rapid development of science and technology, and the emergence of knowledge based societies. In fact, knowledge has replaced capital as the most important determinant of development. The fact is demonstrated from a study by Denison on the growth of US economy between 1929 to 1982, which reveals that 94% of US economic growth is attributed to knowledge generation and dissemination, out of which 64% is due to its research and development alone, and rest 30% is due to advancement in education. This shift from capital to knowledge opens up vast opportunities for all the developing countries including India to accelerate the pace of development. India has already established this fact. Its Green Revolution is a dramatic example of how the input of greater knowledge in the form of improved production technologies increased the productivity of scarce land resources. Further, India's IT Revolution is a striking instance of how the importance of human resource has come to acquire a higher position than that of material, plant, and machinery. The emergence of India as a knowledge superpower in recent years is a fact that is well acknowledged around the globe today.

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This phenomenal thrust forward has been made possible primarily due to the significant growth of science and technology institutions in the country (established and newly established), which have provided the much needed bedrock, impetus and support structure for the development of human capital which has propelled the growth of knowledge industries both in India and abroad. In fact, the world's leading IT organizations such as Microsoft, Intel, AMD, Oracle, CISCO and others have utilized the genius of Indian engineering graduates to propel technology innovations and product development. India has witnessed a huge boom in the BPO/KPO sector also, which are both knowledge and skill intensive sectors. In 1983, when India's total software exports were 12 million, who could imagine that they would multiply 500 times in less than 20 years and the country would be recognized around the world as a major IT power? In fact, India's per capita income increased many fold over the past 20 years and with population growth slowing now to less than 9% per annum; would be sufficient to quadruple the per capita income by 2020. To realize the said rate of economic growth, the country shall have to become superpower in knowledge. Not only in the form of Information Technology but knowledge in form of Manufacturing Technology will raise the competitiveness of the Indian Manufacturers to international standards with respect to costs and quality. The World Bank estimates that India will possess the fourth largest economy in the world by 2020 as India's established credentials in IT and IT enabled services can be leveraged to developing a competitive advantage in other fields such as biotechnology, medicine, pharmaceuticals and agricultural etc. As the world shrinks and competition grows in the current millennium, our scientists and engineers will have to play a key role in meeting the challenges of the future. According to Pandit Jawahar Lal Nehru, "The future belongs to those who make friends with Science". Thus, our goal to make India a leading technically strong nation in the world in the new millennium hinges critically on how successfully, we take Technical Education to the people and create technological capabilities in our society. Proper techniques of knowledge acquisition shall have to be introduced in Technical Education System of the country.

Knowledge Society means "Creating, sharing and using knowledge as the key factor in bringing about prosperity and well being of people". The acquisition of knowledge is explained on the basis of two theories, one presumes that knowledge exists outside the learner and the teacher has to teach and provide that knowledge. The other explanation is that, knowledge resides within the learner and the teacher has to remove the learner's ignorance so that the learner can see his own knowledge and acquire it by self efforts. Indian perspective supports and stresses the later concept which represents constructivist aspect of knowledge. Constructivism is philosophy of learning founded on the premise that, by reflecting on our experiences we construct our own understanding of the world we live in. Each of us generates our own rules and mental models, which we use to make sense of our experiences. Learning is simply the process of adjusting our mental models to accommodate new experience. The guiding principles are:

- Learning is a search for meaning. Therefore, learning must start with the issues around which students are actively trying to construct meaning.
- Meaning requires understanding wholes as well as parts and parts must be understood in the context of wholes. Therefore, the learning process focuses on primary concepts, not isolated facts.
- In order to teach well, we must understand the mental that students use to perceive the world and the assumptions they make to support those models.
- The purpose of learning is for an individual to construct his or her own meaning, not just memorize the "right" answers and regurgitate someone else's meaning. Since education is inherently interdisciplinary, the only valuable way to measure learning is to make the assessment part of the learning process, ensuring it provides students with information on the quality of their learning.

3. CONSTRUCTIVISM INFLUENCES LEARNING AS UNDER

- Curriculum – Constructivism calls for the elimination of a standardized curriculum. Instead, it promotes using curricula customized to the students' prior knowledge. Also, it emphasizes hands-on problem solving.
- Instruction – Under the theory of constructivism, educators focus on making connections between facts and fostering new understanding in students. Instructors tailor their teaching strategies to student responses and encourage students to analyzed, interpret, and predict information. Teachers also rely heavily on open-ended questions and promote extensive dialogue among students.
- Assessment – Constructivism calls for the elimination of grades and standardized testing. Instead, assessment becomes part of the learning process so that students play a larger role in judging their own progress.

Full development of India's enormous human potential will require a shift in national priorities, to commit a greater portion of the country's financial resources to the education sector. India currently invests less than 4% of GNP on

education. Nearby doubling of investments in education with focus on Technical Education, both Vocational and professional, shall be the soundest policy for quadrupling the country's GDP per capita.

4. TECHNICAL EDUCATION IN INDIA MUST BE "RELEVANT, ATTRACTIVE AND CONNECTED"

- RELEVANT to the lives and careers of students, preparing them for a broad range of careers as well as for lifelong learning involving both formal programs and hands-on experience.
- ATTRACTIVE so that the excitement and intellectual content of technology will attract talented students with a wider variety of backgrounds and career interests-particularly women, underrepresented minorities and the disabled – and will empower them to succeed; and
- CONNECTED to the needs and issues of the broader community through integrated activities with other parts of the educational system, industry and government.

In the above context, industry partnership and sponsorship are essential. Government incentives to industry for promoting technical education shall be positive factors, not only for the resource management, but also for making the technical educational processes effective, relevant, and purposeful. Technical education assessment, then, should be concerned with outcomes, inputs, and the educational environment, and it should be capable of measuring progress toward making programs relevant and attractive to students and connected to the broader community. The Accreditation Board for Engineering and Technology (ABET), whose periodic accreditation review is the most widely recognized form of undergraduate engineering program assessment, which include criteria for accrediting programs in engineering in the United States. The task force encourages engineering schools to use these criteria in their program assessments in conjunction with others that are specific to individual school missions. The requirements of reformed curricula are considered to be:

- More interdisciplinary elements and interfaces
- Early industry exposure through project-based learning and internships
- Management knowledge and business process skills
- Opportunities for improving foreign language skills (including foreign experience)
- Interpersonal skills training, and development of a sense of social responsibility
- More flexible course and examination requirements to facilitate joint-programs with universities/polytechnics abroad.

Graduates must demonstrate:

- A strong foundation in basic sciences, mathematics, and engineering and an ability to apply this knowledge ;
- An ability to design and conduct experiments, as well as to analyze and interpret data;
- An ability to design a system, component, or process to meet desired needs;
- An ability to function on multidisciplinary teams;
- An ability to identify, formulates, and solves engineering problems;
- An understanding of professional and ethical responsibility;
- An ability to communicate effectively;
- The broad education necessary to understand the impact of engineering solution in a global/societal context;
- Recognition of the need for and an ability to engage in lifelong learning;
- A knowledge of contemporary issues;
- An ability to use the techniques, skills and modern engineering tools necessary for engineering practice; and
- A strong customer focus

5. CONCLUSION

In the era of world open economy, knowledge and skills is acquired by constructivism; with many fold investment both by the government as well as private sector in education; laying more emphasis on technical education; realizing targeted access and gross enrollment ratio of eleventh plan; and everywhere two hands to work and one mouth to eat; a dream can come true that India becomes the super economic power of the world, provided, technical education system especially the private participation is properly acknowledged and supported and engineering graduates demonstrate the various abilities outlined in the paper.

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EFFECT OF E-CONTROL OF VEHICLES ON HIGHWAY CONSTRUCTION – A CASE STUDY

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ABSTRACT

This paper involves a case study which has been carried out for the first time to know the effect of e-control of vehicles on Highway construction. By using vehicle diagnostic sensor, fuel sensor & global positioning system, fuel can be saved on the highway construction to the extent of about 15%. It also checks the illegal sale of fuel by drivers.

Keywords: Global, Operation, Positioning, Evaluation, Consumption, VTS, GPS, Diagnostic.

1. INTRODUCTION

1.1 An efficient transport system is a pre-requisite for sustained economic development of a country. Road transport is the most widely prevalent and used system of transportation. With the fast development of the country, the construction of Highways has increased manifold in the country.

1.2 The highway construction materials are carried through tippers, trucks etc. So in keeping pace with the speed of construction, an efficient transport system is required.

2. HOW PRESENT SYSTEM WORKS?

In the present system the start & end points for the transportation of highway construction material are defined but there is no check on its route, fuel consumption of vehicle, theft of fuel, halt at any point on the way etc. The truck/tipper drivers are habitual to make various halts on the way & even sell the petrol/diesel of the vehicles being used. So, the transportation becomes more costly and vehicles take more time to reach its destination.

3. WHAT IS REQUIRED?

In the present scenario when speed of Highway construction has increased and the materials used in the construction are generally very large in quantities, an efficient & economical transport system is required. As a good & extensive road network leads to speedy & inclusive growth of economy which in turn improves the living standard of people, so the demand is always to keep the roads in a better condition & sufficiently wide to ensure safe and speedy movements. Fulfilling such demand again requires an efficient transport system. So a system is required for optimal utilization of transporting vehicles which can be managed /controlled from any location sitting in office.

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4. A CASE STUDY

4.1 Selection of Project for Study

The project of Belgaum-Dharwad-Hubli-Haveri-Chitradurga-Tumkur-Bengalore (Belgaum-Dharwad section from km.433 to km.515) of NH-4 in the State of Karnataka was selected for the case study. The length of project is 82 km & is being 6-laned at a cost of Rs.480.00 crores on DBFO (Design, Built, Finance & Operation) pattern. The execution of work is being carried out by National Highways Authority of India.

4.2 Vehicle Tracking System

A Vehicle Tracking System (VTS) was installed in all the Vehicles in the month of August, 2011 used on this project (Tippers & Trucks only). The VTS has various sensors like Vehicle Diagnostic Sensors, Fuel Sensor, Global Positioning System (GPS) etc.

4.3 Data Collection

The live data of all these vehicles was placed on website of the project named as www.intellyserve.com.

4.4 Location of Vehicles

The location of vehicles can be seen in the real time with the VTS. So the location of vehicle is known at all the times which can also be useful of the anti theft of the vehicles, to keep an eye on the employees activities and changing the route of the vehicles in case of traffic jams etc.

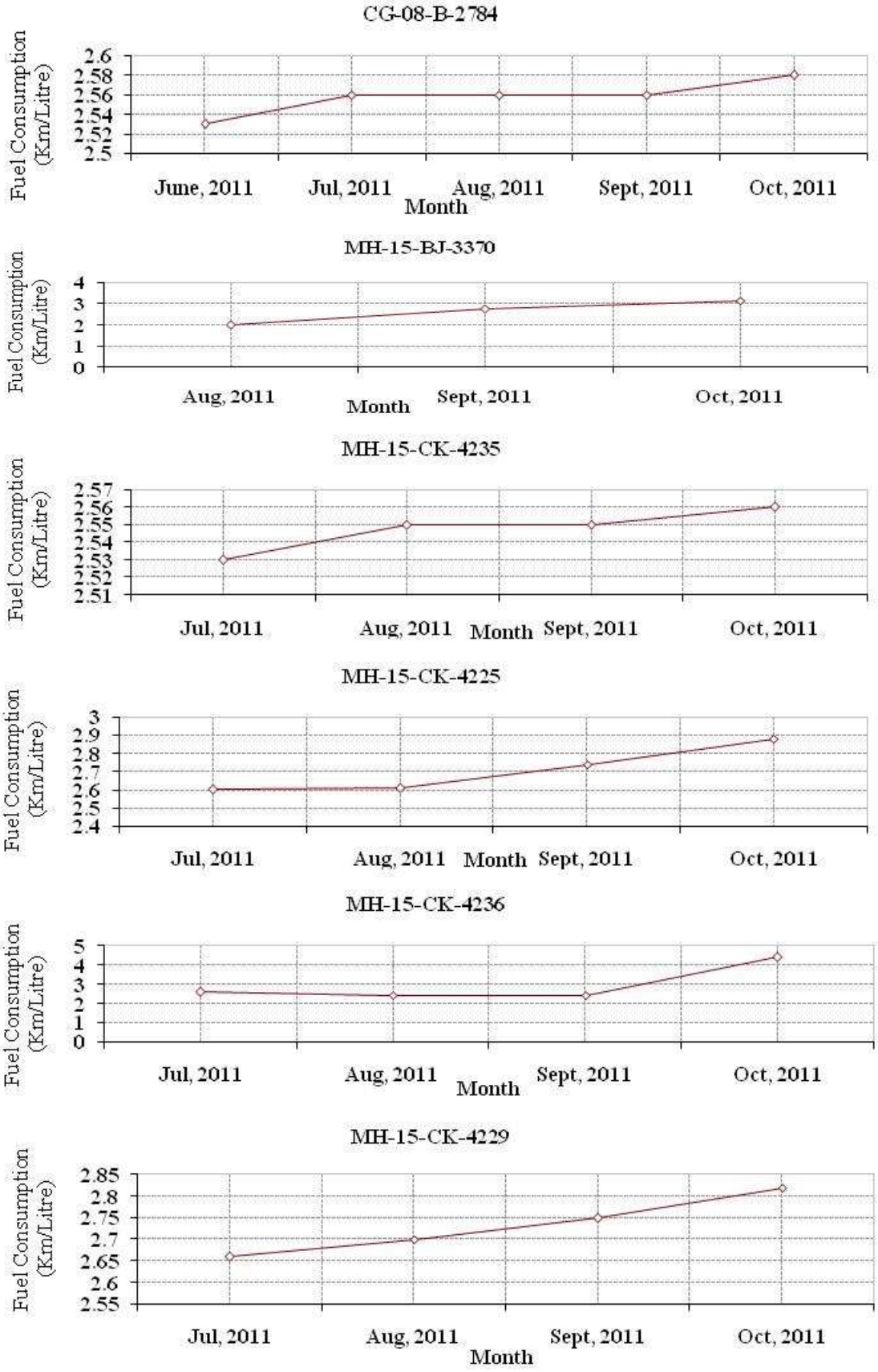
4.5 Evaluation of Data

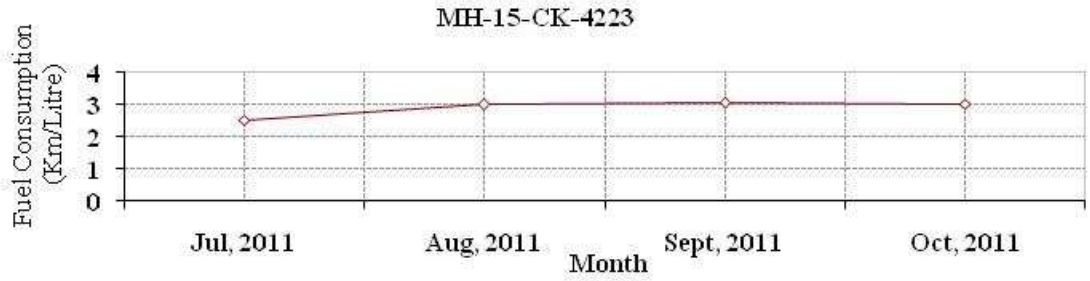
(4.5.1)

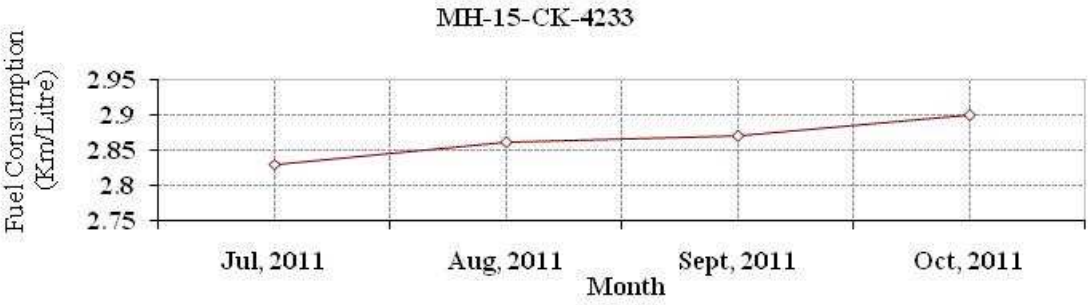
- The vehicle wise data placed on the web site was evaluated for fuel consumption/km and is tabulated as under:

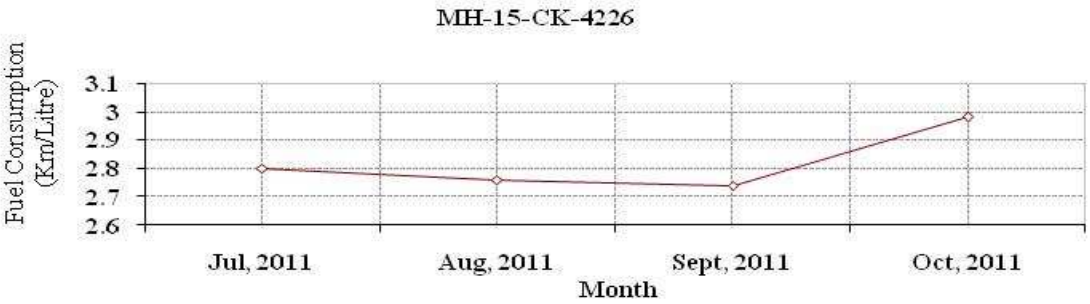
Month	**Vehicle Details**	**CG-08-B-2784**	**MH-15-BJ-3370**	**MH-15-CK-4235**	**MH-15-CK-4225**	**MH-15-CK-4236**	**MH-15-CK-4229**	**MH-15-CK-4223**	**MH-15-CK-4234**	**MH-15-CK-4233**	**MH-15-CK-4226**
July, 2011	Running KM	5372.00	0.00	3972.00	5462.00	4010.00	4500.00	4971.00	5110.00	5690.00	4269.00
	Fuel Consumed	2101.00	35.00	1570.00	2100.00	1540.00	1690.00	1970.00	1990.00	2010.00	1522.00
	Average	2.56	0.00	2.53	2.60	2.60	2.66	2.52	2.57	2.83	2.80
Aug, 2011	Running KM	4143.00	524.00	5943.00	5116.00	5913.00	5853.00	5359.00	5621.00	6059.00	5600.00
	Fuel Consumed	1620.00	263.00	2330.00	1960.00	2420.00	2165.00	1790.00	1940.00	2122.00	2030.00
	Average	2.56	1.99	2.55	2.61	2.44	2.70	2.99	2.90	2.86	2.76
Sept, 2011	Running KM	3334.00	3517.00	3219.00	4882.00	3712.00	4314.00	1553.00	4723.00	4499.003505.00	3505.00
	Fuel Consumed	1300.00	1280.00	1260.00	1780.00	1520.00	1570.00	510.00	1630.00	1570.00	1280.00
	Average	2.56	2.76	2.55	2.74	2.44	2.75	3.05	2.90	2.87	2.74
Oct, 2011	Running KM	1290.00	3211.00	2812.00	3606.00	6178.00	2768.00	2518.00	2139.00	3249.00	3311.00
	Fuel Consumed	500.00	1020.00	1100.00	1250.00	1395.00	980.00	830.00	720.00	1120.00	1110.00
	Average	2.58	3.15	2.56	2.88	4.43	2.82	3.03	2.97	2.90	2.98

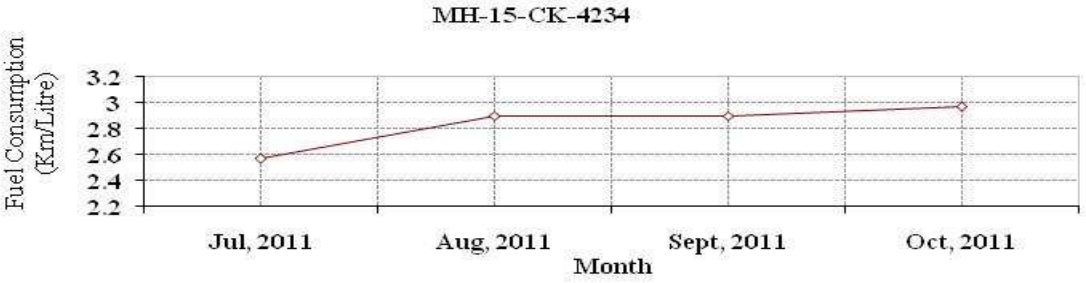
- Corresponding to each vehicle, the graphs of month wise fuel consumption were plotted. The data for the month of July is without VTS.


CG-08-B-2784
Fuel Consumption (Km/Litre)
2.6
2.58
2.56
2.54
2.52
2.5
June, 2011
Jul, 2011
Aug, 2011
Sept, 2011
Oct, 2011
Month
MH-15-BJ-3370
Fuel Consumption (Km/Litre)
4
3
2
1
0
Aug, 2011
Sept, 2011
Oct, 2011
Month
MH-15-CK-4235
Fuel Consumption (Km/Litre)
2.57
2.56
2.55
2.54
2.53
2.52
2.51
Jul, 2011
Aug, 2011
Sept, 2011
Oct, 2011
Month
MH-15-CK-4225
Fuel Consumption (Km/Litre)
3
2.9
2.8
2.7
2.6
2.5
2.4
Jul, 2011
Aug, 2011
Sept, 2011
Oct, 2011
Month
MH-15-CK-4236
Fuel Consumption (Km/Litre)
5
4
3
2
1
0
Jul, 2011
Aug, 2011
Sept, 2011
Oct, 2011
Month
MH-15-CK-4229
Fuel Consumption (Km/Litre)
2.85
2.8
2.75
2.7
2.65
2.6
2.55
Jul, 2011
Aug, 2011
Sept, 2011
Oct, 2011
Month









- The fuel average details per day of every vehicle are tabulated as below:

Vehicle details	July-11	Aug-11	Sept-11	Oct-11	Remarks
CG-08-B-2784	2.56	2.56	2.56	2.58	Performance improved
MH-15-BJ-3370	0.00	1.99	2.75	3.15	Performance improved
MH-15-CK-4235	2.53	2.55	2.55	2.56	Performance improved
MH-15-CK-4225	2.60	2.61	2.74	2.88	Performance improved
MH-15-CK-4236	2.60	2.44	2.44	4.43	Performance improved
MH-15-CK-4229	2.66	2.70	2.75	2.82	Performance improved
MH-15-CK-4223	2.52	2.99	3.05	3.03	Performance improved
MH-15-CK-4234	2.57	2.90	2.90	2.97	Performance improved
MH-15-CK-4233	2.83	2.86	2.87	2.90	Performance improved
MH-15-CK-4226	2.80	2.76	2.74	2.98	Driver removed
Gross Average	2.63	2.64	2.73	3.03	

So, with the use of the VTS with various sensors, there is saving of 15.21% in the fuel consumption.

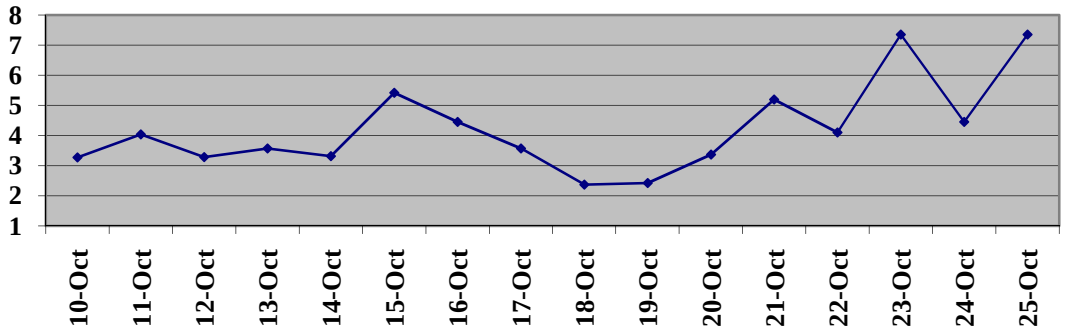
(4.5.2) The data was also evaluated in respect of the followings:

- Kms travelled in a day
- Working hours of vehicles in a day
- Halt hours of vehicles/day
- Idle hours of vehicles/day
- Speed of vehicles

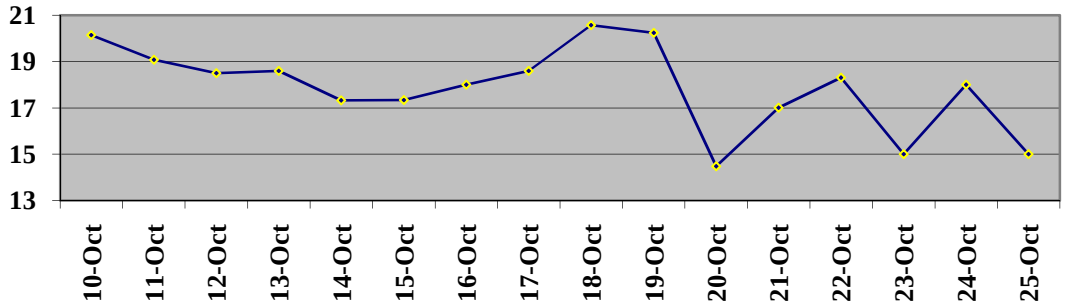
The study was made in respect of all the vehicles used at site. However, the data of only one vehicle (being constraint of space) for the month of Oct, 2011 is tabulated below:

Vehicle Number - MH 15 CK 4236				Vehicle Type – Tata Tipper		
Date	**Distance**	**Working Hours**	**Idle Hours**	**Halt Hours**	**Fuel Consumed**	**Avg Speed**
10.10.11	128.93	3.27	0.27	20.14	30	60
11.10.11	193.04	4.04	0.27	19.08	50	50
12.10.11	199.89	3.28	0.21	18.5	50	40
13.10.11	288.24	3.57	0.18	18.59	60	45
14.10.11	162.89	3.32	0.24	17.32	40	60
15.10.11	280.54	5.42	0.55	17.33	50	55
16.10.11	234.57	4.45	1.15	18	40	40
17.10.11	176.85	3.57	0.18	18.59	35	50
18.10.11	101.88	2.37	0.39	20.57	20	40
19.10.11	110.49	2.42	0.53	20.23	20	45
20.10.11	136.74	3.37	0.44	14.48	25	40
21.10.11	214.42	5.2	1.4	17	50	30
22.10.11	198.88	4.1	1.2	18.3	45	30
23.10.11	350.04	7.35	1.25	15	90	45
24.10.11	256.42	4.45	1.15	18	60	45
25.10.11	350.55	7.35	1.25	15	90	45

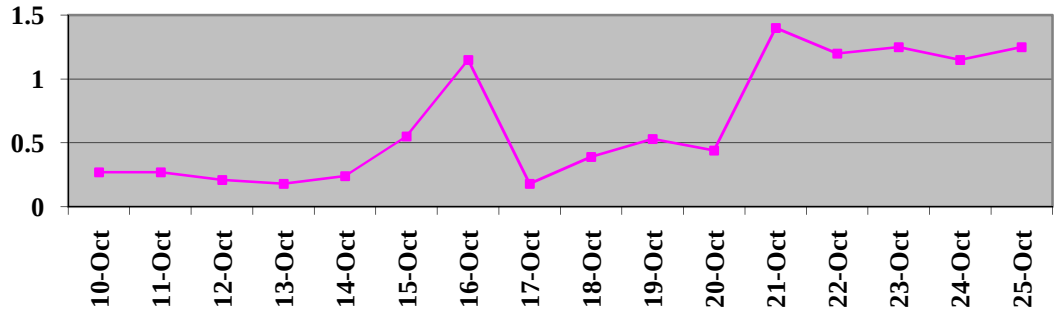
Working hours / day v/s date



Halt hours / day v/s date



Idle hours / day v/s date



So the system is quiet efficient to check the kms travelled by the vehicle in a day, working hours of vehicles/day, halt hours of vehicles/day, idle hours of vehicles/day & speed of vehicles etc.

5. ADVANTAGES OF e-TRACKING SYSTEM

5.1 VTS helps in monitoring vehicles from remote locations and update the managers with the latest information of Vehicles, helps in optimal utilization of the Transporting Vehicles/Mobile Assets.

5.2 In case of traffic jams, the route of next vehicles can be changed.

5.3 It helps in collecting and analyzing the information like fuel consumption, mileage, security status, location, idle hours, running hours, running speed etc.

5.4 Warning signals in case of theft of fuel/lost of track and vehicle can be quickly located if it is stolen.

5.5 VTS can help to reduce running costs by specifically targeting speed and waste fuel. By focusing upon these drivers it is possible to not only reduce fuel and maintenance bills, but to also reduce insurance premiums.

5.6 Productively of workers can be increased by being able to keep track of lunch hours, exposing unauthorized stops & breaks and by evaluating the overtime requests of workers.

5.7 GPS system reduces the amount of paperwork that drivers fill out and also increases the accuracy of records.

5.8 Wastage in fuel can be controlled and efficiency of vehicle can be improved with stringent monitoring.

5.9 Insurance companies look very favorably on companies that install GPS personal vehicle tracking software.

6. DISADVANTAGES OF e-TRACKING SYSTEM

6.1 When drivers find job opportunity on other projects where there is no such e-tracking system, they leave the job otherwise their salary will have to be increased.

6.2 The owner of vehicle has to make the initial investment on the system and then on regular maintenance.

6.3 The drivers of vehicles generally don't prefer this system and try to keep the system non-functional or in repairable position.

7. CONCLUSION

By using VTS, vehicle diagnostic sensor, fuel sensor, GPS etc., we can reach to a substantial result of achieving a great saving of fuel and malpractices used by drivers. A graphical study of the system will certainly improve the efficiency of the vehicles.

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